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purchasinginfo@kcdc.org
www.kcdc.org

Invitation for Sealed Bids

Solicitation Name and Number	Construction of Multifamily Housing Phase 1 of Austin Homes Redevelopment C20007
Responses Must Arrive No Later Than	2:00 p.m. on June 9, 2020 (as KCDC's clocks indicate)
Deliver Responses to:	Knoxville's Community Development Corporation Procurement Division (behind the main office building) 901 N. Broadway Knoxville, TN 37917
Electronic Copies	Electronic copies are available on KCDC's webpage or by email at purchasinginfo@kcdc.org**.**
Responses may be Emailed to KCDC	☒ Yes ☐ No
Printed Responses Required	☐ Yes ☒ No
Solicitation Meeting	☒ Yes ☐ No
Solicitation Meeting is Mandatory	☐ Yes ☒ No ☐ Not Applicable
Solicitation Meeting Date and Time	May 20, 2020 at 10:30 a.m.
Solicitation Meeting Connection	KCDC will host an on-line meeting. Email **purchasinginfo@kcdc.org** for the web link.
Site Visit Schedule	The site is open for your inspection as you wish.
Questions About This Solicitation	KCDC will not accept questions via telephone. Submit questions to **purchasinginfo@kcdc.org by** 4:00 p.m. on May 28,2020.
Bid Opening	The "bid opening" will be conducted via **Zoom**. Contact **purchasinginfo@kcdc.org** to obtain the meeting link.
Award Results	KCDC posts the award decision to its web page at: http://www.kcdc.org/procurement/.
Open Records/Public Access to Documents	All document provided to KCDC are subject to the Tennessee Open Meetings Act (TCA 8-44-101) and open records requirements.
Plans/Blueprints	Blueprints/plans are available from Knoxville Blueprint
Check KCDC's webpage for addenda and changes before submitting your response	

General Information

1. **Background and Intent**

a. Knoxville's Community Development Corporation (KCDC) is the public housing and redevelopment agency for the City of Knoxville and for Knox County in Tennessee. KCDC's affordable housing property portfolio includes 20 sites with approximately 3,525 dwelling units.

b. KCDC uses "supplier" as inclusive of various words describing interested parties often called "vendor," "bidders," "contractors" and "proposers."

c. This solicitation is for the first phase of the owner's Austin Homes Redevelopment and consists of the construction of 105 housing units and related sitework and site improvements. The units will be in 9 buildings and include 44-1 bedroom, 40-2 bedroom, 17-3 bedroom, and 4-4 bedroom unit types. The total approximate square footage is 141,760.

d. The project infrastructure package including mass grading, primary storm sewer system, water and sewer mains, electrical primary system, street lighting, roadways and sidewalks in the right of way, is being performed under a separate contract. The selected supplier will work cooperatively with the infrastructure supplier to coordinate the work and schedules of each contract to benefit the delivery of the buildings and units in accordance with the approved schedule.

2. **Bonds**

Bid, payment and performance bonds are required if the bid exceeds $100,000 in value. The supplier will include all bonding costs in the base bid. Bonding requirements include:

a. A bid **bond** from each supplier equivalent to five percent (5%) of the bid price. Such bid bond must accompany the bid. Bid bonds will not be returned until a contract is signed.

b. Performance and payment **bonds** for 100% of the contract price.

c. All bonding companies must be listed in the "Federal Register, Department of the Treasury Fiscal Service, Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies; Notice." Companies licensed to do business in the State of Tennessee must issue all required bonds.

3. **Changes after Award**

It is possible that after award KCDC will need to revise the service needs or requirements specified in this document. KCDC reserves the right to make such changes after consultation with the supplier. Should additional costs arise, the supplier must document increased costs. KCDC reserves the right to accept or reject and negotiate these charges.

4. **Codes and Ordinances**

All work covered is to be done in full accord with national, state and local codes, ordinances and orders that are in effect at the time the work is performed.

5. **Contact Policy**
Only contact KCDC's Procurement Division about this solicitation from the issuance of this solicitation until award. Information obtained from an unauthorized officer, agent, or employee will not affect the risks or obligations assumed by the supplier or relieve the supplier from fulfilling any of the conditions of the resulting award for the purpose of this project. Such contact can disqualify the supplier from the solicitation process.

6. **Contract Approval**
The resulting contract is subject to KCDC's Board approval.

7. **Contract Documents**
KCDC has posted a prototype of the standard contract and rider that will be used to its webpage. Please review these documents before submitting a bid.

8. **Damage**
The supplier is responsible for all damage to buildings, equipment, grounds, premises and all other types of potential damage resulting from the provision of the services requested herein.

9. **Employees**
Supplier will:

a. Allow only personnel thoroughly trained and skilled to work on the job. Employees are not to be accompanied in their work area by acquaintances, family members, assistants or any person unless said person is an authorized employee of the supplier.

b. Have sufficient personnel to complete the work in a timely manner.

c. Provide adequate supervision and adequate discipline among his/her employees.

d. Provide at least one employee on every job assignment with the ability to speak, read, write and understand English so owner's staff can communicate effectively with them.

e. Employ the quantity and quality of supervision necessary for both effective and efficient management at all times.

f. Ensure that employees have proper identification displayed while on the job site. Employees must wear a company uniform or have photo identification badges at all times.

g. Employees parking vehicles (whether corporately or privately owned) must ensure that company identification is on the vehicles. This may be by placards on the vehicle's side, laminated paper with the company name placed on the dashboard or other means.

10. **Equipment**
Supplier shall provide all necessary equipment, materials, supplies, et cetera needed for the work. Include the cost for such equipment, materials and supplies in the price quoted.

11. **Evaluation**

KCDC will evaluate this as a formal sealed bid and the award is to the "lowest and best." KCDC alone determines (using NIGP's definition and other relevant sources as appropriate) the supplier's "responsive" and "responsible" status prior to award. Responsible means a business with the financial and technical capacity to perform the requirements of the solicitation and subsequent contract. A responsive bid is one that fully conforms in all material respects to the solicitation document and all of its requirements, including all form and substance. KCDC reserves the right to request additional information to assist in the evaluation process; this includes references and business capacity information.

12. **General Instructions to Suppliers**

KCDC's General Instructions to Suppliers are at www.kcdc.org. Click on "Procurement" and the link to the instructions. The supplier's submittal means acceptance of the terms and conditions set forth in KCDC's "General Instructions to Suppliers."

13. **Insurance**

See Appendix 1. These insurances and levels are required and not optional. If you or your insurance agent have concerns or believe that some coverages are not necessary, email purchasinginfo@kcdc.org detailing any requested changes before this solicitation's due date. The supplier will include all insurance costs in the base bid.

14. **Invoicing**

a. KCDC will process pay applications once per month.

b. Suppliers are required to submit invoices within 90 days following the delivery of the goods or services. KCDC may deny invoices submitted after the 90-day threshold.

c. Suppliers will need to set up their access to KCDC's Supplier Portal to track actual payments made.

d. KCDC's purchases of goods are exempt from Tennessee sales and use tax pursuant to Tennessee Code Annotated 67-6-329(a) (4) and KCDC is generally exempt from the Federal Excise tax.

   Suppliers are subject to Tennessee sales and use tax on all materials and supplies used in the performance of a contract, whether such materials and supplies are purchased by the supplier, produced by the supplier, or provided to the supplier by KCDC, pursuant to Tennessee Code Annotated 67-6-209. The supplier will pay all taxes incurred in the performance of an awarded contract.

15. **Licensure**

a. Suppliers must possess and maintain proper licensure from the State of Tennessee and all other authorities having jurisdiction throughout the term of this award.

b. In addition to any City or County licenses that may be required, all suppliers must be licensed as required by the State of Tennessee's "Contractor's Licensing Act of 1994."

c. The Executive Director of the State Contractor Licensing Board says one of these licenses is required:
   - BC
   - BC-B

d. Any subsequent rulings by the State Licensing Board automatically revise these specifications- irrespective of the timing of the notice from the State and irrespective of the status of this solicitation.

e. Additional information is at **https://www.tn.gov/commerce/regboards/contractors.html**.

16. **Liquidated Damages**
    Liquidated damages of $500.00 per calendar day for each day beyond the scheduled completion date apply and are included in the award. This applies to the scheduled completion date for each phase of the approved project schedule.

17. **Measurements and Drawings**
    Complete responsibility for the final determination of dimensions lies with the supplier. The supplier shall verify all dimensions with the actual on-site conditions. Where the supplier's work is to join another trade, the supplier's shop drawings shall show actual dimensions and the method of joining the work of those trades.

18. **Permits**
    The supplier shall obtain and pay for or cause its subcontractors to obtain and pay for all permits required to complete required work. In addition, supplier shall arrange, schedule and pay for or cause its subcontractors to arrange, schedule and pay for all required final inspections by state, local, or independent certified inspecting authorities necessary for issuance of all required owner utilization permits for the work.

19. **Representations**
    By submitting a response, the supplier certifies:

a. That the supplier is financially solvent and that it is experienced in and competent to perform the type of work, and/or to furnish the personnel, plans, materials, supplies, or equipment to be performed or furnished by it; and

b. That the supplier is familiar with all federal, state, municipal and county laws, ordinances and regulations, which may in any way affect the work of those employed therein, including but not limited to any special acts relating to the work or to the project of which it is a part; and

c. That the supplier carefully examined the plans, specifications and the worksite and that from its own investigations, has satisfied itself as to the nature and location of the work, the character, quality, quantity of surface and subsurface materials likely to be encountered, and character of equipment and other facilities needed for the performance of the work, the general and local conditions and all other materials which may in any way affect the work or its performance.

20. **<u>Responsibilities</u>**
    At no expense to owners, the supplier will:

a. Provide quality control for all services provided.

b. Provide competent supervision.

c. Provide competent workers.

d. Take precautions necessary to protect persons or property against injury and/or damage and be responsible for any such damage or injury that occurs because of their fault or negligence.

e. Perform work without unnecessary interference with the activities of owners, residents, or suppliers.

21. **Safety/OSHA Guideline Compliance**

a. The supplier is responsible for providing and placing barricades, tarps, plastic, flag tape and other safety/traffic control equipment to protect the public, surrounding areas, equipment and vehicles.

b. The safety of staff and the public is of prime concern to KCDC and all costs associated are the responsibility of the supplier.

c. The supplier shall ensure that its employees exercise all necessary caution and discretion to avoid injury to persons or damage to property.

d. The supplier will protect all buildings, appurtenances and furnishings from damage. The supplier shall, at his expenses, repair such damages (or replace the items) by approved methods to restore the damaged areas to their original condition.

e. Supplier shall use caution signs as required by OSHA Regulation 1910.144 and 1910.145 at no cost to KCDC. Caution signs shall be on-site at commencement of contract.

f. Supplier shall comply with all other OSHA and TOSHA safety standards that apply.

22. **Section 3 of the HUD Act of 1968**

Section 3 is a provision of the Housing and Urban Development Act of 1968 which requires that programs of direct financial assistance administered by the U.S. Department of Housing and Urban Development (HUD) provide, to the greatest extent feasible, opportunities for job training and employment to lower income residents in connection with projects in their neighborhoods. Further, to the greatest extent feasible, contracts in connection with these projects are to be awarded to local businesses. Section 3 is a tool for fostering local economic development, neighborhood economic improvement and individual self-sufficiency.

a. Recipients and suppliers must make a good faith effort to utilize Section 3 area residents as trainees and employees in connection with the project. Targeted recruitment and the selection of Section 3 area residents for available positions are two examples of good faith efforts to meet this requirement.

b. Recipients and suppliers must make a good faith effort to award contracts to Section 3 business concerns for work in connection with the project. An example of a good faith effort to meet this requirement is the implementation of an affirmative action plan, which includes targets for the number and dollar value for awarding contracts to Section 3 business concerns.

c. Recipients and suppliers must keep records and submit reports to HUD documenting the good faith efforts taken and the results of these actions. Examples of such documentation include letters to community organizations, employment development and business development centers, copies of solicitations for bids or proposals; and copies of affirmative action plans.

d. How can businesses find Section 3 residents to work for them? This can be accomplished by recruiting in the neighborhood and public housing developments to tell about available training and job opportunities.

   Distributing flyers, posting signs, placing ads, and contacting resident organizations and local community development and employment agencies to find potential workers are a few effective ways of getting jobs and people together.

e. All contracts awarded are subject to Section 3 requirements. Supplier shall seek to fill any and all positions that are needed and unfilled with residents of KCDC communities. For additional information, please go to http://www.hud.gov/offices/fheo/section3/Section3.pdf. The successful supplier will supply KCDC with job announcements for any position that must be filled as a result of the award of owner's work.

   Additionally the successful supplier will supply the same job announcement to the Knoxville-Knox County Committee Action Committee's Workforce Connections group. These can be faxed to 544-5269.

f. A Section 3 resident is one who lives within a public housing authority's site. It is also people who live in an area with a HUD assisted program and whose income is below HUD's low income requirements.

g. A Section 3 business is one that:

   1. Is at least 51% owned by a Section 3 resident; or

   2. Employs Section 3 residents for at least 30% of its employee base; or

   1. Makes a commitment to sub contract at least 25% of the project's dollars to a Section 3 business.

h. Upon award, the successful supplier will supply two documents to KCDC:

   1. A Section 3 Business determination (forms supplied by KCDC) provided one is not already on file.

   2. A Section 3 Business plan for this work.

23. **Security**

The successful supplier is responsible for providing any necessary security to equipment, materials, personnel, tools and the site that are required for this job. KCDC is not responsible for damage or losses to equipment, materials, personnel, tools or the site.

24. **Site Examination**

a. Suppliers are required to visit the site and become fully acquainted and familiar with conditions, as they exist and the required operations. The supplier shall make such investigations as necessary so that they may fully understand the scope of the work and related facilities and possible complexities when executing the work.

b. The failure or omission of the supplier to receive or examine the solicitation document or any part of the specifications, or to visit the site(s) and acquaint themselves as to the nature and location of the work, the general and local conditions and all matters which may in any way affect performance shall not relieve the supplier of any obligation to perform as specified herein.

   Supplier understands the intent and purpose hereof and its obligations hereunder and that it shall not make any claim for, or have any right to damages resulting from any misunderstanding or misinterpretation of the resulting agreement, or because of any lack of information.

c. By submitting a response to this solicitation, each supplier is certifying that they have inspected the site and have read the solicitation and all appendices and addenda. The failure or omission of any supplier to receive or examine any form, instrument, or document shall in no way relieve the supplier from any obligation in respect to its bid.

25. **Smoke Free Policy**

KCDC has a Smoke Free policy that applies to you, your employees and all subcontractors. This policy mandates:

- No smoking on KCDC's property
- No e-vape or similar usage on KCDC's property
- The Smoke Free policy applies in personal or corporate vehicles on KCDC's property

HUD definitions include:

✓ "Smoking" means inhaling, exhaling, burning or carrying any lighted or heated cigar, cigarette or pipe, or any other lighted or heated tobacco or plant product intended for inhalation, including hookahs and marijuana, whether natural or synthetic, in any manner or in any form. "Smoking" also includes the use of an electronic smoking device which creates an aerosol or vapor, in any manner or in any form.

✓ "Electronic Smoking Device" means any product containing or delivering nicotine or any other substance intended for human consumption that can be used by a person in any manner for the purpose of inhaling vapor or aerosol from the product.
The term includes any such device, whether manufactured, distributed, marketed or sold as an e-cigarette, e-cigar, e-pipe, e-hookah or vape pen or under any other product name or descriptor.

✓ Property means all KCDC owned buildings, parking lots, streets, structures and **land** .

Should supplier staff be observed violating these requirements, KCDC's Procurement Division will notify the corporate level contact about the problem. Should there be recurrences; KCDC may ask the supplier to not send the employee to owner's property.
Repeated offenses may result in forfeiture of your awarded "contract."

26. **Storm Water and Street Ordinances**
The City of Knoxville's Storm Water and Street Ordinances apply to this solicitation. The successful supplier will comply with the City's ordinances. Compliance includes but is not limited to:

a. Retaining all sediments on the project site using structural drainage controls. Drainage control costs are incidental to the work.

b. Not discharging any construction or demolition related materials, wastes, spills, or residues from the project site to streets, drainage facilities, or adjacent properties by wind or runoff.

c. Containing non-storm water runoff from equipment and vehicle washing and any other activity at the project site.

d. Additional information about NPDES, BMPs and the Land Development Manual at http://www.cityofknoxville.org/engineering/stormwater/npdes.asp**.**

e. The successful supplier is responsible for all work, remediation, repair and monetary penalties or fines arising out of a Notice of Violation of the City of Knoxville's Storm Water and Street Ordinances. The supplier will be charged costs KCDC incurs to install structural drainage controls or remedy a Notice of Violation. KCDC shall also charge a $50 fee per violation for related administrative costs.

f. KCDC will prepare, submit and pay the permitting fees. Upon award, the successful supplier will be required to sign onto the permit and be responsible for implementing and maintaining all erosion control measures as required on the SWPPP.

27. **Subcontractors**
Subcontractors must:

a. Be approved by KCDC prior to beginning work.

b. Carry the insurance coverages as outlined herein.

c. Comply with the federal Davis Bacon requirements and submit certified payrolls.

d. Not be on the general federal government, HUD's nor the State of Tennessee's debarment lists.

e. Not be changed without owner's permission.

28. **Time for Completion**
Supplier will achieve substantial completion of the entire project within 16 months from the date of the Notice To Proceed. Upon award, the successful supplier will work with the owners to develop a schedule that is satisfactory to the owners.
The schedule will include buildings being completed and turned over to the owners in phases to be determined. Liquidated damages will apply to the completion dates for each phase.

29. **Wage Compliance (Davis Bacon Requirements)**
Federal Davis Bacon Wage Requirements apply to this work. The successful supplier will:

a. Submit certified payrolls showing compliance with the Davis Bacon requirements herein. Failure to do so is sufficient cause for withholding payment and/or termination of the contract.

b. Must pay its employees at least weekly pursuant to the Davis Bacon determination listed herein.

c. Will display all pages of Wage Posters, in a "prominent spot" at the job site. These are available from the Procurement Division.

d. Will allow KCDC to conduct on-site Davis Bacon interviews of the supplier's employees. KCDC will use HUD forms and record the information.

e. Classify employees by the applicable Davis Bacon classification. Classifications are determined by the work performed and the tools ***used***-not by job titles.

f. Two General Decisions apply for this work. The Residential decision applies to buildings 2 to 8. The Building decision applies to building 1.

Residential Decision Information

General Decision Number	TN20200022
Date	01-03-2020
State	Tennessee
Construction Types	**Residential**
Counties	Anderson and Knox Counties in Tennessee
Residential	Residential Construction Projects (consisting of single-family homes and apartments up to and including 4 stories.
Modification Number	0

Classifications and Rates	Rate	Fringe 1
Bricklayer	$12.72	$0.00
Carpenter Including Cabinet Installation	$13.89	$0.00
Cement Mason/Concrete Finisher	$16.00	$0.00
Electrician	$18.52	$2.32
Laborer: Common or General	$8.00	$0.00
Laborer: Landscape	$12.33	$0.30
Operator: Backhoe	$13.17	$0.00
Plumber	$17.50	$0.00
Roofer: Including Shake and Shingle	$10.25	$0.00
Welders: Receive rate prescribed for craft performing operation to which welding is incidental.		

Building Decision Information

General Decision Number	TN20200092
Date	01-03-2020
State	Tennessee
Construction Types	**Building**
Counties	Knox County in Tennessee
Residential	Building Construction Projects (does not include single-family homes or apartments up to and including 4 stories.
Modification Number	0

Classifications and rates:

Classifications and Rates	Rate	Fringe 1
Boilermaker	$30.07	$21.61
Bricklayer	$28.03	$2.39
Carpenter including drywall hanging but excludes cabinet installation and scaffold building)	$14.79	$0.25
Drywall Finisher/Taper	$14.09	$0.24
Electrician including alarm installation	$25.99	$11.67
Glazier	$14.89	$2.69
HVAC Mechanic (Installation of HVAC unit only. Excludes installation of HVAC pipe and duct).	$12.75	$1.49
Ironworkers, Structural and Reinforcing	$28.02	$14.97
Laborer: Common or General	$12.62	$2.45
Laborer: Mason Tender-Brick	$12.74	$0.00
Laborer: Roof Tearoff	$9.75	$0.49
Operator: Bobcat/skid steer/skid loader	$17.05	$0.00
Operator: Mechanic	$18.33	$3.67
Operator: Paver (Asphalt, Aggregate and Concrete)	$13.50	$0.00
Operator: Roller	$13.98	$0.00
Pipefitter includes HVAC pipe installation	$29.01	$13.90
Plumber excludes HVAC pipe installation	$18.73	$4.23
Roofer: Built up roof	$12.74	$0.00
Roofer: Rubber Roof	$16.82	$4.77
Roofer: Single Ply Roof	$16.50	$0.32
Sheet Metal Worker: Includes HVAC duct and metal roof installation but excluded siding/wall panel installation on metal buildings	$14.88	$1.48
Tile Finisher	$10.00	$0.74
Truck Driver includes dump truck, material truck and pickup truck	$12.56	$0.00
Welders: Receive rate prescribed for craft performing operation to which welding is incidental.		

g. Suppliers ***may not*** "use a classification" because there is not one listed that exactly identifies the work performed.

Unlisted Classifications needed for work not included within the scope of the classifications listed above may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)). To request an additional classification:

- Write a brief letter to KCDC (upon award) stating the title needed and the proposed pay rate. Indicate that the employees are in agreement with the rate. The rate must bear a reasonable resemblance to other rates on the classification.

- If the additional classification is for a subcontractor, the subcontractor writes a similar letter to the General Supplier who then sends a cover letter to KCDC officially requesting the classification.

- KCDC will review the request and forward it to HUD and officially request it or KCDC will suggest that the supplier revise the request.

- HUD will review the request and approve it (or decline it) and send it to the Department of Labor for final approval.

- The Department of Labor will either approve the request or recommend a different minimum rate.

- HUD will notify KCDC of the decision.

- Should either HUD or the Department of Labor require a higher minimum rate, KCDC will notify the supplier. The higher minimum rate, if any, must be paid for work completed (back wages) and for all future work under this project.

h. These requirements apply to all subcontractors that are used by the successful supplier.

i. Davis Bacon rates are locked in at the bid opening provided that a contract is awarded within 90 days. If a contract is not awarded within 90 days after the bid opening and if a new decision is released, it will apply. Modifications released 10 days or less before a bid opening are not applicable as there is not time to incorporate the changes in the bid.

j. In all cases however, suppliers are required to adhere to Davis Bacon standards as the Department of Labor determines - irrespective of any announcements KCDC may have made.

30. **Weather**

KCDC provides allowances for excessive inclement weather since this solicitation calls for liquidated damages-provided the supplier exceeds the guaranteed number of days for completion.

a. <u>Extensions of Contract Time</u>

If the basis exists for an extension of time in accordance with this solicitation, then an extension of time based on weather may be granted only for the number of weather delay days in excess of the number of weather days listed as the Standard Baseline for that month.

b. Standard Baseline for Average Climatic Range

The Standard Baseline is the normal and anticipated number of calendar days for each month during which adverse weather will prevent activity. Suspension of activity for the number of days each month as listed in the Standard Baseline is to be included in the work and not eligible for an extension of the contract time. The baseline is:

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
12	11	8	7	7	6	7	5	4	5	6	11

c. Adverse Weather and Weather Delay Days

1. Adverse weather is the occurrence of one or more of the following conditions which prevents only exterior activity or access to the site within a twenty-four hour period:

   a. Precipitation (rain, snow or ice) in excess of one-tenth inch (0.10”) liquid measure.

   b. Temperatures which do not rise above 32 degrees Fahrenheit by 10:00 a.m.

   c. Standing snow in excess of one inch (1.00”).

2. Adverse weather may include, if appropriate, “dry-out” or “mud” days when all of the following are met:

   a. For rain above the Standard Baseline.

   b. Only if there is a hindrance to site access or site work or excavation and supplier has taken all reasonable accommodations to avoid such hindrance.

   c. At a rate, no greater than one make-up day for each day or consecutive days of rain beyond the Standard Baseline that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the KCDC.

3. A weather delay day occurs only if adverse weather prevents work on the project for 50 percent or more of the supplier’s scheduled workday, including a weekend day or holiday if the supplier has scheduled construction activity that day.

d. Documentation and Submittals

1. Submit Daily Jobsite Work Log showing which and to what extent activities were affected by weather on a monthly basis.

2. Submit actual weather data to support a claim for the time extension obtained from nearest NOAA weather station or other independently verified source approved by the KCDC at the beginning of the project.

3. Maintain a rain gauge, thermometer and clock at the jobsite. Keep daily records of precipitation, temperature and the time of each occurrence throughout the project.

4. Use the Standard Baseline data provided in this section when documenting actual delays due to weather in excess of the average.

5. Organize claim documentation on calendar month periods and submit in accordance with the procedures for claims established by the KCDC.

e. Approval by KCDC

1. If the extension of the contract time is appropriate, it will occur in accordance with the provisions of this solicitation.

2. KCDC shall not incur extra costs for any extra time increase to the contract.

Scope of Work

See the “Project Manual” and “Plans” for the scope of work. The project manual follows this page. The plans are on KCDC’s webpage.

PROJECT MANUAL

A New Multi-Family Development for:

Knoxville's Community Development Corporation Austin Homes Redevelopment – Phase 1A

Burge Drive & Harriet Tubman Street
Knoxville, Tennessee 37915

May 6, 2020

JAI Project No. 193076-1A

ARCHITECT:

Johnson Architecture, Inc.
2240 Sutherland Avenue, Suite 105
Knoxville, Tennessee 37919
865-671-9060

CONSULTANTS:

Architect Consultant:	Gensler
Civil Engineering:	Civil & Environmental Consultants, Inc.
Structural Engineering:	Bender & Associates
Mechanical Engineering:	Engineering Services Group, Inc.
Plumbing Engineering:	Engineering Services Group, Inc.
Fire Protection Engineering:	Engineering Services Group, Inc.
Electrical Engineering:	Engineering Services Group, Inc.
Landscape Architecture:	IBI Placemaking

A New Multi-Family Development for:

Knoxville's Community Development Corporation
Austin Homes Redevelopment – Phase 1A

Burge Drive & Harriet Tubman Street
Knoxville, Tennessee 37915

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G1.2	ARCHITECTURAL SITE PLAN
G1.3	ARCHITECTURAL SITE SECTIONS
G1.4	MULTIFAMILY - ADDRESSING
G1.5	TOWNHOMES - ADDRESSING
G2.1	UL ASSEMBLIES - U376
G2.2	UL ASSEMBLIES - U305
G2.3	UL ASSEMBLIES - L506
G2.4	UL ASSEMBLIES - L528
G2.5	UL ASSEMBLIES - X701
G2.6	UL ASSEMBLIES - U344
G2.7	UL ASSEMBLIES – U905
G2.8	UL ASSEMBLIES – U301
G4.1	INTERIOR ROOM FINISH LEGEND & FINISH NOTES
G4.2	TYPICAL UNIT MILLWORK & CASEWORK DETAILS
G4.3	TYPICAL MILLWORK & CASEWORK DETAILS - BUILDING 1

04.1 - B1 - MF - GENERAL

MF - A0.1	PROJECT INFORMATION
MF - A0.2	CODE ANALYSIS
MF - A0.3	EXIT ANALYSIS
MF.G0.0	MULTIFAMILY NET AREA USABLE PLANS
MF.G0.1	MULTIFAMILY GROSS LIVING AREA PLANS
MF - LS1.0	LIFE SAFETY PLAN - LEVEL 00
MF - LS1.1	LIFE SAFETY PLAN - LEVEL 01
MF - LS1.2	LIFE SAFETY PLAN - LEVEL 02
MF - LS1.3	LIFE SAFETY PLAN - LEVEL 03
MF - LS1.4	LIFE SAFETY PLAN - LEVEL 04
MF - LS1.5	LIFE SAFETY PLAN - LEVEL 05

04.2 - B1 - MF - ARCHITECTURAL

MF - A1.0	FLOOR PLAN - LEVEL 00
MF - A1.1A	FLOOR PLAN - LEVEL 01 PARKING
MF - A1.1B	FLOOR PLAN - LEVEL 01
MF - A1.2	FLOOR PLAN - LEVEL 02
MF - A1.3	FLOOR PLAN - LEVEL 03
MF - A1.4	FLOOR PLAN - LEVEL 04
MF - A1.5	FLOOR PLAN - LEVEL 05
MF - A1.6	FLOOR PLAN - ROOF LEVEL

MF - A2.0	REFLECTED CEILING PLAN - LEVEL 00
MF - A2.1	REFLECTED CEILING PLAN - LEVEL 01
MF - A2.2	REFLECTED CEILING PLAN - LEVEL 02-05
MF - A3.1	BUILDING ELEVATIONS
MF - A3.2	BUILDING ELEVATIONS
MF - A3.3	BUILDING ELEVATIONS
MF - A3.4	BUILDING ELEVATIONS
MF - A3.5	AXONOMETRIC VIEWS
MF - A4.1	BUILDING SECTIONS
MF - A4.2	BUILDING SECTIONS
MF - A4.3	WALL SECTIONS
MF - A4.4	WALL SECTIONS
MF - A4.5	WALL SECTIONS
MF - A4.6	DETAILS
MF - A4.7	DETAILS
MF - A4.8	DETAILS
MF - A4.9	DETAILS
MF - A4.10	TYPICAL DETAILS
MF - A4.11	TYPICAL DETAILS
MF - A5.1	ENLARGED STAIR PLANS AND SECTIONS
MF - A5.2	DETAILS - STAIRS
MF - A5.3	DETAILS - STAIRS
MF - A5.4	ENLARGED ELEVATOR PLAN AND HOISTWAY
MF - A5.5	DETAILS - ELEVATOR
MF - A6.1	DOOR SCHEDULES AND ELEVATIONS
MF - A6.2	WINDOW ELEVATIONS
MF - A6.3	DETAILS - WINDOW ASSEMBLIES
MF - A6.4	DETAILS - WINDOW ASSEMBLIES
MF - A6.5	STOREFRONT ELEVATIONS
MF - A6.6	DETAILS - STOREFRONT ASSEMBLIES
MF - A7.0	OVERALL FINISH FLOOR PLAN 00
MF - A7.1	OVERALL FINISH FLOOR PLAN - LEVEL 01
MF - A7.2	OVERALL FINISH FLOOR PLAN - LEVELS 02 - 05
MF - A7.3	ENLARGED PLAN & INTERIOR ELEVATIONS - COMMUNITY ROOM
MF - A7.4	ENLARGED PLAN & RCP - ENTRIES AND AMENITY ROOM
MF - A7.5	FINISH PLAN AND ELEVATIONS - ENTRIES AND AMENITY ROOM
MF - A7.6	ENLARGED PLAN & INTERIOR ELEVATIONS - FITNESS ROOM
MF - A7.7	ENLARGED PLANS AND ELEVATIONS - UNIT A
MF - A7.8	ENLARGED PLANS AND ELEVATIONS - UNIT B
MF - A7.9	ENLARGED PLANS AND ELEVATIONS - UNIT C
MF - A7.10	ENLARGED PLANS AND ELEVATIONS - UNIT D
MF - A7.11	ENLARGED PLANS AND ELEVATIONS - UNIT E
MF - A7.12	ENLARGED PLANS AND ELEVATIONS - UNIT F

MF - A7.13	ENLARGED PLANS AND ELEVATIONS - UNIT G
MF - A7.14	ENLARGED PLANS AND ELEVATIONS - UNIT H
MF - A7.15	ENLARGED PLANS AND ELEVATIONS - UNIT J
MF - A7.16	ENLARGED PLANS AND ELEVATIONS - ADA UNIT 103
MF - A7.17	ENLARGED PLANS AND ELEVATIONS - ADA UNIT 208
MF - A7.18	ENLARGED PLANS AND ELEVATIONS - ADA UNIT 311
MF - A7.19	GAZEBO DETAILS

04.3 - B1 - MF - STRUCTURAL

MF.S1.100	STRUCTURAL NOTES
MF.S1.101	FOUNDATION PLAN
MF.S1.102	LEVEL 01 - FLOOR FRAMING PLAN
MF.S1.103	LEVEL 02 - FLOOR FRAMING PLAN / LOWER ROOF
MF.S1.104	LEVEL 03 - FLOOR FRAMING PLAN
MF.S1.105	LEVEL 04 - FLOOR FRAMING PLAN
MF.S1.106	LEVEL 05 - LOW ROOF FRAMING PLAN
MF.S1.107	UPPER ROOF FRAMING PLAN
MF.S2.100	STRUCTURAL DETAILS
MF.S2.101	STRUCTURAL DETAILS
MF.S2.102	STRUCTURAL DETAILS
MF.S2.103	STRUCTURAL DETAILS
MF.S2.104	STRUCTURAL DETAILS

04.4 - B1 - MF - MECHANICAL

MF - M1.0	BLDG 1A - LEVEL 00 (PARKING) - HVAC
MF - M1.1	BLDG 1A - LEVEL 01 (LOBBY) - HVAC
MF - M1.2	BLDG 1A - LEVEL 02 - HVAC
MF - M1.3	BLDG 1A - LEVEL 03 - HVAC
MF - M1.4	BLDG 1A - LEVEL 04 - HVAC
MF - M1.5	BLDG 1A - LEVEL 05 - HVAC
MF - M1.6	BLDG 1A - ROOF - HVAC
MF - M2.0	SCHEDULES & DETAILS - HVAC
MF - M2.1	DETAILS - HVAC

04.5 - B1 - MF - PLUMBING

MF - P1.0	BLDG 1A - LEVEL 00 - UNDERGROUND PLUMBING
MF - P1.1	BLDG 1A - LEVEL 00 - WASTE AND VENT
MF - P1.2	BLDG 1A - LEVEL 01 - WASTE & VENT
MF - P1.3	BLDG 1A - LEVEL 02 - WASTE & VENT
MF - P1.4	BLDG 1A - LEVEL 03 - WASTE & VENT
MF - P1.5	BLDG 1A - LEVEL 04 - WASTE & VENT
MF - P1.6	BLDG 1A - LEVEL 05 - WASTE & VENT

MF - P2.1	BLDG 1A - LEVEL 00 - SERVICES
MF - P2.2	BLDG 1A - LEVEL 01 - SERVICES
MF - P2.3	BLDG 1A - LEVEL 02 - SERVICES
MF - P2.4	BLDG 1A - LEVEL 03 - SERVICES
MF - P2.5	BLDG 1A - LEVEL 04 - SERVICES
MF - P2.6	BLDG 1A - LEVEL 05 - SERVICES
MF - P3.1	LEGEND, SCHEDULES & DETAILS - PLUMBING
MF - P3.2	FIRE STOPPING DETAILS
MF - P4.1	RISER DIAGRAMS
MF - P4.2	RISER DIAGRAMS
MF - P4-3	RISER DIAGRAMS
MF - P4-4	RISER DIAGRAMS

04.6 - B1 - MF - FIRE PROTECTION

MF - FP1.1	BLDG 1A - LEVEL 00 - FIRE PROTECTION
MF - FP1.2	BLDG 1A - LEVEL 01 - FIRE PROTECTION
MF - FP1.3	BLDG 1A - LEVEL 02 - FIRE PROTECTION
MF - FP1.4	BLDG 1A - LEVEL 03 - FIRE PROTECTION
MF - FP1.5	BLDG 1A - LEVEL 04 - FIRE PROTECTION
MF - FP1.6	BLDG 1A - LEVEL 05 - FIRE PROTECTION
MF - FP2.1	CALCS AND DETAILS - FIRE PROTECTION
MF - FP2.2	DETAILS - FIRE PROTECTION
MF - FP2.3	FIRE STOPPING DETAILS

04.7 - B1 - MF - ELECTRICAL

MF-E0.1	SITE PLAN - ELECTRICAL
MF-E1.0	BLDG 1A - LEVEL 00 - LIGHTING
MF-E1.1	BLDG 1A - LEVEL 01 - LIGHTING
MF-E1.2	BLDG 1A - LEVEL 02 - LIGHTING
MF-E1.3	BLDG 1A - LEVEL 03 - LIGHTING
MF-E1.4	BLDG 1A - LEVEL 04 - LIGHTING
MF-E1.5	BLDG 1A - LEVEL 05 - LIGHTING
MF-E2.0	BLDG-1A - LEVEL 00 - POWER
MF-E2.1	BLDG 1A - LEVEL 01 - POWER
MF-E2.2	BLDG 1A - LEVEL 02 - POWER
MF-E2.3	BLDG 1A - LEVEL 03 - POWER
MF-E2.4	BLDG 1A - LEVEL 04 - POWER
MF-E2.5	BLDG 1A - LEVEL 05 - POWER
MF-E2.6	BLDG 1A - ROOF LEVEL - POWER
MF-E3.0	BLDG 1A - LEVEL 00 - COMMUNICATIONS
MF-E3.1	BLDG 1A - LEVEL 01 - COMMUNICATIONS
MF-E3.2	BLDG 1A - LEVEL 02 - COMMUNICATIONS

MF-E3.3	BLDG 1A - LEVEL 03 - COMMUNICATIONS
MF-E3.4	BLDG 1A - LEVEL 04 - COMMUNICATIONS
MF-E3.5	BLDG 1A - LEVEL 05 - COMMUNICATIONS
MF-E4.0	LEGEND_ SCHEDULES_ DETAILS
MF-E4.1	ELECTRICAL DETAILS
MF-E4.2	PANELBOARDS
MF-E4.3	PANELBOARDS
MF-E4.4	PANELBOARDS
MF-E4.5	PANELBOARDS
MF-E4.6	PANELBOARDS
MF-E4.7	PANELBOARDS
MF-E4.8	FEEDER RISER DIAGRAM

06.0 - B2 - TH - LIFE SAFETY

TH2.LS1.0	BUILDING 2 - LIFE SAFETY PLANS
TH2.LS1.1	BUILDING 2 - ACCESSIBILITY INFORMATION

06.1 - B2 - TH - ARCHITECTURAL

TH2.A1.1	BUILDING 2 - FIRST FLOOR PLAN
TH2.A1.2	BUILDING 2 - SECOND FLOOR PLAN
TH2.A1.3	BUILDING 2 - THIRD FLOOR PLAN
TH2.A2.1	BUILDING 2 - REFLECTED CEIILING PLAN, ROOF PLAN & NOTES
TH2.A3.1	BUILDING 2 - EXTERIOR ELEVATIONS
TH2.A3.2	BUILDING 2 - 3D VIEWS
TH2.A4.1	BUILDING 2 - BUILDING SECTIONS
TH2.A4.2	BUILDING 2 - WALL SECTIONS
TH2.A4.3	BUILDING 2 - WALL SECTIONS
TH2.A4.4	BUILDING 2 - WALL SECTIONS

06.2 - B2 - TH - STRUCTURAL

TH2.S1.1	BUILDING 2 - STRUCTURAL PLANS

06.3 - B2 - TH - MECHANICAL

TH2.M1.1	BUILDING 2 - FIRST FLOOR PLAN -HVAC
TH2.M1.2	BUILDING 2 - SECOND FLOOR PLAN - HVAC
TH2.M1.3	BUILDING 2 - THIRD FLOOR PLAN - HVAC
TH2.M1.4	BUILDING 2 - ROOF PLAN - HVAC

06.4 - B2 - TH - PLUMBING

TH2.P1.1	BUILDING 2 - FIRST FLOOR PLAN - PLUMBING

06.5 - B2 - TH - FIRE PROTECTION

TH2.FP1.1	BUILDING 2 - FLOOR PLANS - FIRE PROTECTION

06.6 - B2 - TH - ELECTRICAL

TH2.E1.1	BUILDING 2 - FIRST FLOOR PLAN - ELECTRICAL
TH2.E1.2	BUILDING 2 - SECOND FLOOR PLAN - ELECTRICAL
TH2.E1.3	BUILDING 2 - THIRD FLOOR PLAN - ELECTRICAL

07.0 - B3 - TH - LIFE SAFETY

TH3.LS1.0	BUILDING 3 - LIFE SAFETY PLANS

07.1 - B3 - TH - ARCHITECTURAL

TH3.A1.1	BUILDING 3 - FIRST FLOOR PLAN
TH3.A1.2	BUILDING 3 - SECOND FLOOR PLAN
TH3.A2.1	BUILDING 3 - REFLECTED CEIILING PLAN, ROOF PLAN & NOTES
TH3.A3.1	BUILDING 3 - EXTERIOR ELEVATIONS
TH3.A3.2	BUILDING 3 - 3D VIEWS
TH3.A4.1	BUILDING 3 - BUILDING SECTIONS
TH3.A4.2	BUILDING 3 - WALL SECTIONS
TH3.A4.3	BUILDING 3 - WALL SECTIONS
TH3.A4.5	BUILDING 3 - WALL SECTIONS
TH3.A4.6	BUILDING 3 - WALL SECTIONS

07.2 - B3 - TH - STRUCTURAL

TH3.S1.1	BLDG.3 STRUCTURAL PLANS

07.3 - B3 - TH - MECHANICAL

TH3.M1.1	BUILDING 3 - FIRST FLOOR PLAN - HVAC
TH3.M1.2	BUILDING 3 - SECOND FLOOR PLAN - HVAC
TH3.M1.3	BUILDING 3 - ROOF PLAN - HVAC

07.4 - B3 - TH - PLUMBING

TH3.P1.1	BUILDING 3 - FLOOR PLANS - PLUMBING

07.5 - B3 - TH - FIRE PROTECTION

TH3.FP1.1	BUILDING 3 - FLOOR PLANS - FIRE PROTECTION

07.6 - B3 - TH - ELECTRICAL

TH3.E1.1	BUILDING 3 - FIRST FLOOR PLAN - LIGHTING & COMMUNICATIONS
TH3.E1.2	BUILDING 3 - FIRST FLOOR PLAN - POWER
TH3.E1.3	BUILDING 3 - SECOND FLOOR PLAN - LIGHTING & COMMUNICATIONS
TH3.E1.4	BUILDING 3 - SECOND FLOOR PLAN - POWER

08.0 - B4 - TH - LIFE SAFETY

TH4.LS1.0	BUILDING 4 - LIFE SAFETY PLANS
TH4.LS1.1	BUILDING 4 - ACCESSIBILITY INFORMATION

08.1 - B4 - TH - ARCHITECTURAL

TH4.A1.1	BUILDING 4 - FIRST FLOOR PLAN
TH4.A1.2	BUILDING 4 - SECOND FLOOR PLAN
TH4.A1.3	BUILDING 4 - THIRD FLOOR PLAN
TH4.A2.1	BUILDING 4 - REFLECTED CEIILING PLAN, ROOF PLAN & NOTES
TH4.A3.1	BUILDING 4 - EXTERIOR ELEVATIONS
TH4.A3.2	BUILDING 4 - 3D VIEWS
TH4.A4.1	BUILDING 4 - BUILDING SECTIONS
TH4.A4.2	BUILDING 4 - WALL SECTIONS
TH4.A4.3	BUILDING 4 - WALL SECTIONS
TH4.A4.4	BUILDING 4 - WALL SECTIONS

08.2 - B4 - TH - STRUCTURAL

TH4.S1.1	BLDG. 4 STRUCTURAL PLANS
TH4.S1.2	BLDG. 4 STRUCTURAL PLANS

08.3 - B4 - TH - MECHANICAL

TH4.M1.1	BUILDING 4 - FIRST FLOOR PLAN - HVAC
TH4.M1.2	BUILDING 4 - SECOND FLOOR PLAN - HVAC
TH4.M1.3	BUILDING 4 - THIRD FLOOR PLAN - HVAC
TH4.M1.4	BUILDING 4 - ROOF PLAN - HVAC

08.4 - B4 - TH - PLUMBING

TH4.P1.1	BUILDING 4 - FLOOR PLANS - PLUMBING

08.5 - B4 - TH - FIRE PROTECTION

TH4.FP1.1	BUILDING 4 - FLOOR PLANS - FIRE PROTECTION

08.6 - B4 - TH - ELECTRICAL

TH4.E1.1	BUILDING 4 - FIRST FLOOR PLAN - LIGHTING & COMMUNICATIONS
TH4.E1.2	BUILDING 4 - FIRST FLOOR PLAN - POWER
TH4.E1.3	BUILDING 4 - SECOND FLOOR PLAN - LIGHTING & COMMUNICATIONS
TH4.E1.4	BUILDING 4 - SECOND FLOOR PLAN - POWER
TH4.E1.5	BUILDING 4 - THIRD FLOOR PLAN - LIGHTING & COMMUNICATIONS
TH4.E1.6	BUILDING 4 - THIRD FLOOR PLAN - POWER

09.0 - B5 - TH - LIFE SAFETY

TH5.LS1.0	BUILDING 5 - LIFE SAFETY PLANS

09.1 - B5 - TH - ARCHITECTURAL

TH5.A1.1	BUILDING 5 - FIRST FLOOR PLAN
TH5.A1.2	BUILDING 5 - SECOND FLOOR PLAN
TH5.A2.1	BUILDING 5 - REFLECTED CEIILING PLAN, ROOF PLAN & NOTES
TH5.A3.1	BUILDING 5 - EXTERIOR ELEVATIONS
TH5.A3.2	BUILDING 5 - 3D VIEWS
TH5.A4.1	BUILDING 5 - BUILDING SECTIONS
TH5.A4.2	BUILDING 5 - WALL SECTIONS
TH5.A4.3	BUILDING 5 - WALL SECTIONS
TH5.A4.4	BUILDING 5 - WALL SECTIONS

09.2 - B5 - TH - STRUCTURAL

TH5.S1.1	BUILDING 5 - STRUCTURAL PLANS

09.3 - B5 - TH - MECHANICAL

TH5.M1.1	BUILDING 5 - FIRST FLOOR PLAN - HVAC
TH5.M1.2	BUILDING 5 - SECOND FLOOR PLAN - HVAC
TH5.M1.3	BUILDING 5 - ROOF PLAN - HVAC

09.4 - B5 -TH - PLUMBING

TH5.P1.1	BUILDING 5 - FLOOR PLANS - PLUMBING

09.5 - B5 - TH - FIRE PROTECTION

TH5.FP1.1	BUILDING 5 - FLOOR PLANS - FIRE PROTECTION

09.6 - B5 - TH - ELECTRICAL

TH5.E1.1	FIRST FLOOR PLAN - ELECTRICAL
TH5.E1.2	SECOND FLOOR PLAN - ELECTRICAL

10.0 - B6 - TH - LIFE SAFETY

TH6.LS1.0	BUILDING 6 - LIFE SAFETY PLANS

10.1 - B6 - TH - ARCHITECTURAL

TH6.A1.1	BUILDING 6 - FIRST FLOOR PLAN
TH6.A1.2	BUILDING 6 - SECOND & THIRD FLOOR PLAN
TH6.A2.1	BUILDING 6 - REFLECTED CEIILING PLAN, ROOF PLAN & NOTES
TH6.A3.1	BUILDING 6 - EXTERIOR ELEVATIONS
TH6.A3.2	BUILDING 6 - 3D VIEWS
TH6.A4.1	BUILDING 6 - BUILDING SECTIONS

TH6.A4.2	BUILDING 6 - WALL SECTIONS
TH6.A4.3	BUILDING 6 - WALL SECTIONS
TH6.A4.4	BUILDING 6 - WALL SECTIONS
TH6.A4.5	BUILDING 6 - WALL SECTIONS

10.2 - B6 - TH - STRUCTURAL

TH6.S1.1	BUILDING 6 - STRUCTURAL PLANS

10.3 - B6 - TH - MECHANICAL

TH6.M1.1	BUILDING 6 - FIRST FLOOR PLAN - HVAC
TH6.M1.2	BUILDING 6 - SECOND FLOOR PLAN - HVAC
TH6.M1.3	BUILDING 6 - THIRD FLOOR PLAN - HVAC
TH6.M1.4	BUILDING 6 - ROOF PLAN - HVAC

10.4 - B6 - TH - PLUMBING

TH6.P1.1	BUILDING 6 - FLOOR PLANS - PLUMBING

10.5 - B6 - TH - FIRE PROTECTION

TH6.FP1.1	BUILDING 6 - FLOOR PLANS - FIRE PROTECTION

10.6 - B6 - TH - ELECTRICAL

TH6.E1.1	FIRST FLOOR PLAN - ELECTRICAL
TH6.E1.2	SECOND FLOOR PLAN - ELECTRICAL
TH6.E1.3	THIRD FLOOR PLAN - ELECTRICAL

11.0 - B7 - TH - LIFE SAFETY

TH7.LS1.0	BUILDING 7 - LIFE SAFETY PLANS

11.1 - B7 - TH - ARCHITECTURAL

TH7.A1.1	BUILDING 7 - FIRST FLOOR PLAN
TH7.A1.2	BUILDING 7 - SECOND & THIRD FLOOR PLAN
TH7.A2.1	BUILDING 7 - REFLECTED CEIILING PLAN, ROOF PLAN & NOTES
TH7.A3.1	BUILDING 7 - EXTERIOR ELEVATIONS
TH7.A3.2	BUILDING 7 - 3D VIEWS
TH7.A4.1	BUILDING 7 - BUILDING SECTIONS
TH7.A4.2	BUILDING 7 - WALL SECTIONS
TH7.A4.3	BUILDING 7 - WALL SECTIONS
TH7.A4.4	BUILDING 7 - WALL SECTIONS

11.2 - B7 - TH - STRUCTURAL

TH7.S1.1	BUILDING 7 – STRUCTURAL PLANS

11.3 - B7 - TH - MECHANICAL

TH7.M1.1	BUILDING 7 - FIRST FLOOR PLAN - HVAC
TH7.M1.2	BUILDING 7 - SECOND FLOOR PLAN - HVAC
TH7.M1.3	BUILDING 7 - THIRD FLOOR PLAN - HVAC
TH7.M1.4	BUILDING 7 - ROOF PLAN - HVAC

11.4 - B7 - TH - PLUMBING

TH7.P1.1	BUILDING 7 - FLOOR PLANS - PLUMBING

11.5 - B7 - TH - FIRE PROTECTION

TH7.FP1.1	BUILDING 7 - FLOOR PLANS - FIRE PROTECTION

11.6 - B7 - TH - ELECTRICAL

TH7.E1.1	FIRST FLOOR PLAN - ELECTRICAL
TH7.E1.2	SECOND FLOOR PLAN - ELECTRICAL
TH7.E1.3	THIRD FLOOR PLAN - ELECTRICAL

12.0 - B8 - TH - LIFE SAFETY

TH8.LS1.0	BUILDING 8 - LIFE SAFETY PLANS

12.1 - B8 - TH - ARCHITECTURAL

TH8.A1.1	BUILDING 8 - FIRST FLOOR PLAN
TH8.A1.2	BUILDING 8 - SECOND FLOOR PLAN
TH8.A2.1	BUILDING 8 - REFLECTED CEIILING PLAN, ROOF PLAN & NOTES
TH8.A3.1	BUILDING 8 - EXTERIOR ELEVATIONS
TH8.A3.2	BUILDING 8 - 3D VIEWS
TH8.A4.1	BUILDING 8 - BUILDING SECTIONS
TH8.A4.2	BUILDING 8 - WALL SECTIONS
TH8.A4.3	BUILDING 8 - WALL SECTIONS
TH8.A4.4	BUILDING 8 - WALL SECTIONS
TH8.A4.5	BUILDING 8 - WALL SECTIONS

12.2 - B8 - TH - STRUCTURAL

TH8.S1.1	BUILDING 8 - STRUCTURAL PLANS

12.3 - B8 - TH - MECHANICAL

TH8.M1.1	BUILDING 8 - FIRST FLOOR PLAN - HVAC
TH8.M1.2	BUILDING 8 - SECOND FLOOR PLAN - HVAC
TH8.M1.3	BUILDING 8 - ROOF PLAN - HVAC

12.4 - B8 - TH - PLUMBING

TH8.P1.1	BUILDING 8 - FLOOR PLANS - PLUMBING

12.5 - B8 - TH - FIRE PROTECTION

TH8.FP1.1	BUILDING 8 - FLOOR PLANS - FIRE PROTECTION

12.6 - B8 - TH - ELECTRICAL

TH8.E1.1	FIRST FLOOR PLAN - COMMUNICATIONS & LIGHTING
TH8.E1.2	FIRST FLOOR PLAN - POWER
TH8.E1.3	SECOND FLOOR PLAN - COMMUNICATIONS & LIGHTING
TH8.E1.4	SECOND FLOOR PLAN - POWER

13.0 - B9 - TH - LIFE SAFETY

TH9.LS1.0	BUILDING 9 - LIFE SAFETY PLANS

13.1 - B9 - TH - ARCHITECTURAL

TH9.A1.1	BUILDING 9 - FIRST FLOOR PLAN
TH9.A1.2	BUILDING 9 - SECOND & THIRD FLOOR PLAN
TH9.A2.1	BUILDING 9 - REFLECTED CEIILING PLAN, ROOF PLAN & NOTES
TH9.A3.1	BUILDING 9 - EXTERIOR ELEVATIONS
TH9.A3.2	BUILDING 9 -3D VIEWS
TH9.A4.1	BUILDING 9 - BUILDING SECTIONS
TH9.A4.2	BUILDING 9 - WALL SECTIONS
TH9.A4.3	BUILDING 9 - WALL SECTIONS
TH9.A4.4	BUILDING 9 - WALL SECTIONS

13.2 - B9 - TH - STRUCTURAL

TH9.S1.1	BLDG. 9 STRUCTURAL PLANS

13.3 - B9 - TH - MECHANICAL

TH9.M1.1	BUILDING 9 - FIRST FLOOR PLAN - HVAC
TH9.M1.2	BUILDING 9 - SECOND FLOOR PLAN - HVAC
TH9.M1.3	BUILDING 9 - THIRD FLOOR PLAN - HVAC
TH9.M1.4	BUILDING 9 - ROOF PLAN - HVAC

13.4 - B9 - TH - PLUMBING

TH9.P1.1	BUILDING 9 - FLOOR PLANS - PLUMBING

13.5 - B9 - TH - FIRE PROTECTION

TH9.FP1.1	BUILDING 9 - FLOOR PLANS - FIRE PROTECTION

13.6 - B9 - TH - ELECTRICAL

TH9.E1.1	FIRST FLOOR PLAN - ELECTRICAL
TH9.E1.2	SECOND FLOOR PLAN - ELECTRICAL
TH9.E1.3	THIRD FLOOR PLAN - ELECTRICAL

14 - B2 - B9 - TH - GENERAL DETAILS

TH.G1.1	TOWNHOMES DOOR & WINDOW ELEVATIONS, DTLS., NOTES
TH.G1.2	TOWNHOMES DOOR DETAILS
TH.G1.3	TOWNHOME WINDOW DETAILS
TH.G1.4	TOWNHOME WINDOW DETAILS
TH.G1.5	TOWNHOMES WINDOW DETAILS
TH.G2.1	ENLARGED EXTERIOR STAIR PLANS
TH.G2.2	ENLARGED EXTERIOR STAIR SECTIONS AND DETAILS
TH.G2.3	ENLARGED INTERIOR EGRESS STAIR PLANS - BUILDING 2
TH.G2.4	ENLARGED INTERIOR EGRESS STAIR SECTIONS - BUILDING 2
TH.G2.5	ENLARGED INTERIOR EGRESS STAIR - BUILDING 4
TH.G2.6	ENLARGED INTERIOR EGRESS STAIR - BUILDING 5
TH.G2.7	ENLARGED INTERIOR EGRESS STAIR PLANS - BUILDING 6
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The requested data or file(s) is described as follows: _____

_____

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By signature below, the recipient agrees to the above conditions:

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Firm

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Date

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SECTION 01 10 00

SUMMARY OF THE WORK

PART I GENERAL

1.01 WORK INCLUDED:

A. Furnish all labor, materials and equipment, and perform all work to construct, as specified herein and **"A New Multi-Family Development For: Knoxville's Community Development Corporation; Austin Homes Redevelopment – Phase 1A,"** shown on the accompanying drawings. The building shall be constructed complete and ready for occupancy except for the items specifically excluded in "Work Not Included".

B. The work shall include; selective demolition, site preparation, building construction, plumbing, heating, ventilating and air conditioning; electrical work; special equipment as specified; furnishings, and site improvements as shown and specified.

C. Patch any existing work damaged by construction.

1.02 WORK NOT INCLUDED:

A. The following items of work will be provided by the Owner or by others under separate contracts:

1. Movable furniture unless specifically shown on the drawings and specifications.
2. Any other items noted on the drawings as "N.I.C." or "Not In Contract".

B. The following work in connection with the items listed in paragraph 1.02A preceding shall be part of the General Contract work:

1. Verification of correct location of electrical receptacles, telephone outlets, and similar outlets to suit equipment arrangement.
2. Provision of telephone outlet boxes and conduit turned out above ceiling for use by owner's telephone contractor.
3. Installation of Owner Provided Kitchen Equipment. The contractor is responsible for coordinating delivery schedules, site access, connections and their locations, etc.

1.03 CONTRACTOR'S USE OF PREMISES:

A. Before construction is started the Contractor shall confer with the Architect and the Owner and arrange for available trucking and storage space for the delivery of materials, storage space for materials and equipment, and parking space for his workmen.

B. Construction operations and storage of materials and equipment shall be restricted to areas of the site mutually agreed upon and in such a manner as not to block access of fire fighting equipment to the building and facilities.

C. Construction vehicular traffic and the operation of construction equipment such as cranes, bulldozers, and other similar equipment shall be carefully supervised and controlled to avoid damage to existing structures and facilities which are to remain in place.

1.04 VERIFICATION OF DIMENSIONS:

A. Dimensions, elevations, and locations shown on the drawings in reference to existing structures and utilities are the best available data obtainable but are not guaranteed by the Architect or the Owner and the Architect and the Owner will not be responsible for their accuracy.

B. Before proceeding with any work dependent upon the data involved, the Contractor shall field check and verify all dimensions, grades, line levels, or other conditions of limitations at the site and building to avoid construction errors. If any work is performed by the Contractor or by his Subcontractors prior to adequate verification of applicable data, any resultant extra cost for adjustment of work to conform to existing limitations shall be borne by the Contractor without reimbursement or compensation by the Owner.

1.05 CONTROL POINTS AND LAYOUT:

A. The initial lines, grades, and dimensions necessary for the location and control of the work under the Contract are shown on the Contract Drawings.

B. The Contractor shall provide for himself all additional and supplementary lines and grades as may be necessary to layout the work and insure proper control of the work until completed. It shall be the Contractor's responsibility to satisfy himself as to the accuracy of all measurements before construction.

1.06 SUBSTANTIAL COMPLETION OF THE WORK:

A. Upon substantial completion of any phase of the work, the Owner shall assume complete responsibility for the maintenance and operation of the heating, ventilating and air conditioning system and service utilities in that portion of the project.

B. The Owner shall also become responsible for all other maintenance and damage and ordinary wear and tear and, with the exception of items under guarantee, the cost of repairs or restoration during the period between substantial and final completion.

C. The Owner shall have the responsibility to have in effect all necessary insurance for protection against any losses not directly attributable to the Contractor's negligence.

D. Upon substantial completion, payments for work in the substantially complete portion of the work shall be released to the Contractor, except for the retainage and an amount to cover the cost of the incomplete or deficient items included in the punch list made at the inspection to determine substantial completion. This amount shall be approximately the value of the punch list items as estimated by the Architect.

E. The Contractor shall arrange a schedule so that punch list items are completed in the designated time by working during regular working hours. The Contractor shall be afforded access to the occupied portion of the building to perform this work during regular working hours.

1.07 ENVIRONMENTAL HAZARDOUS PRODUCTS, MATERIALS, WASTE:

A. Do not incorporate in the Work hazardous materials or products as currently defined in the Resource Conservation and Recovery Act of 1976 (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), or Environmental Protection Agency (EPA) regulations, rules, or requirements, as amended, unless the Contract Documents give no other option than to provide a material or product which contains a hazardous material, component, constituent, waste, or leachate. In studying the Contract Documents and carrying out the Work, report at once to the Designer the discovery of a product or material which contains hazardous materials, components, constituents, waste, or leachate.

B. Do not incorporate in the Work a product or material which contains concentrations of a constituent, component, or material above the threshold levels which would require adherence to hazardous waste disposal regulations as currently defined, or could cause a release or threat of release of a hazardous substance at a level that would require a remedial response or removal action as currently defined by RCRA, CERCLA, or the EPA.

C. Select materials and products meeting specified requirements which comply with EPA requirements as regards hazardous materials content. In making requests for substitutions, determine that materials and products proposed for substitution comply with RCRA, CERCLA, and EPA requirements.

1.08 BUILDING PRODUCTS USE:

A. It is the responsibility of the Contractor to inform himself concerning the application of the products he uses to follow the directions of the Architect and manufacturer.

B. In the event of disagreement between the Contract Documents and the manufacturer's directions, the Contractor will obtain written instructions from the Architect before proceeding with the installation.

C. If the Contractor has knowledge of or reason to believe the likelihood of failure, he will transmit such knowledge to the Architect, and ask for written instructions before proceeding with the work.

1.09 OWNERSHIP OF REMOVED MATERIALS AND EQUIPMENT:

A. All removed existing materials and equipment designated to be removed which are not to remain the property of the Owner or are not noted to be reused in the new work shall become the property of the Contractor and shall be removed from premises and site and disposed of by him.

1.10 SEPARATE CONTRACTS:

A. The Owner plans to award separate contracts in connection with the project. The work in these separate contracts will proceed simultaneously with the execution of this Contract. The Contractor shall coordinate operations with the separate contractors. The Contractor will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractor, including his subcontractors, shall keep himself informed of the progress and the detailed work of the separate contractors and shall notify the Architect immediately of the lack of progress or defective workmanship that will interfere with his own operations. Failure of the Contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress or defective workmanship by the separate contractors shall be construed as acceptance of him of the state of the work as being satisfactory for proper coordination with his own work.

B. The separate contractors will provide competent foremen or supervisors for the installation of their equipment and they are to confer with the Contractor and his subs and other separate contractors where required in regard to connections and installations.

1.11 DISCRETIONARY FUND:

A. The General Contractor shall include in the base bid an lump sum amount of ($750,000.00) **Seven Hundred Fifty Thousand dollars and 00 cents** which shall constitute a discretionary fund. This fund shall be used at the discretion of the Architect and the Owner. Upon completion of the work, the Contractor shall credit his final request for payment in the amount of all or any unused portion of this fund.

PART II PRODUCTS – NOT USED

PART III EXECUTION – NOT USED

End of Section

SECTION 01 16 00

REGULATORY REQUIREMENTS

PART I GENERAL

1.01 GENERAL:

A. Where codes and standards are referenced in this and other sections of the specifications or on the drawings, whether or not a particular edition is referenced, it is the intention that these be the latest editions as adopted by the governing agency under whose jurisdiction the project is to be constructed. The latest edition shall be the edition in effect on the date approval is granted for construction to begin.

1.02 CODES:

A. Work shall conform to the requirements of the building code indicated on the drawings. If no code is listed, work shall conform to the requirements of the building code in effect for the jurisdiction having authority.

B. Work shall conform to the requirements of the life safety code indicated on the drawings. If no code is listed, work shall conform to the requirements of the life safety code in effect for the jurisdiction having authority.

C. Plumbing and gas piping work shall conform to the requirements of the plumbing and gas codes indicated on the drawings. If no code is listed, work shall conform to the requirements of the plumbing and gas codes in effect for the jurisdiction having authority.

D. Work shall conform to the requirements of the electrical code indicated on the drawings. If no code is listed, work shall conform to the requirements of the electrical code in effect for the jurisdiction having authority.

E. Work shall conform to the requirements of the latest edition of ICC/ANSI A117.1 Standard on Accessible and Usable Buildings and Facilities.

F. Work shall conform to the requirements of the latest edition of Americans with Disabilities Act (ADA).

1.03 CODE STANDARDS:

A. Fire doors shall conform to requirements of NFPA No. 80, Standards for Fire Doors and Windows.

B. Heating, ventilating and air conditioning work shall conform to requirements of NFPA NO. 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.

1.04 REGULATIONS:

A. Electrical work shall conform to applicable regulations of the State, Department of Insurance, Division of Fire Prevention and to applicable regulations of the Local Utility Company.

B. Work shall be performed in a manner approved by the Occupational Safety and Health Administration. The Contractor shall be responsible for job-site safety and training of workman as required by Occupational Safety and Health Administration.

C. Contractors performing work in schools constructed before 1978 or in any facilities where children under the age of 6 are present shall be certified and shall follow work practices to prevent lead contamination as mandated by the Environmental Protection Agency.

1.05 MATERIAL AND TESTING STANDARDS:

A. Components of the work shall conform to requirements of American Society for Testing and Materials (ASTM) Standards, American National Standards Institute (ANSI) standards, and Trade Association Standards, as listed in the various other sections of the specifications.

1.06 MANUFACTURER'S RECOMMENDATIONS:

A. When work in accordance with manufacturer's recommendations is specified, a copy of those recommendations shall be kept in the job office.

PART II PRODUCTS – NOT USED

PART III EXECUTION – NOT USED

End of Section

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART I GENERAL

1.01 GENERAL:

A This Section includes administrative and procedural requirements for submittal and approval of substitutions.

1.02 RELATED DOCUMENTS:

A Applicable provisions of the General Conditions, Supplementary Conditions, and other Division 1, General Requirements, apply to the work under this section.

1.03 DEFINITIONS:

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.

2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.04 SUBMITTALS:

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of form provided in the Project Manual.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

i. Operational efficiency and energy consumption for equipment and

appliances.

e. Samples, where applicable or requested.

f. Certificates and qualification data, where applicable or requested.

g. List of similar installations if requested, for completed projects with project names and addresses and names and addresses of architects and owners.

h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

i. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

j. Cost information, including a proposal of change, if any, in the Contract Sum.

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.05 QUALITY ASSURANCE:

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.06 PROCEDURES:

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS:

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 10 days prior to the date of the Bid. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction if applicable.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and

consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 EXECUTION - NOT USED

End of Section

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION:

PART I GENERAL

1.01 COORDINATION OF WORK OF SUBCONTRACTORS:

A. It is the responsibility of the Contractor to coordinate the work of his mechanical and electrical subcontractors. To this end the Contractor shall require that the mechanical and electrical subcontractors examine and familiarize themselves with the architectural and structural drawings as well as the mechanical and electrical drawings and that they frequently consult with each other and all other trades so that the work can be properly coordinated.

B. The Contractor shall carefully check the work of his subcontractor in order to deliver to the Owner the contract work complete and properly installed in conformance with the Contract requirements.

1.02 CUTTING AND PATCHING:

A. Cut and patch existing work that is to remain in place as necessary for the installation of new work.

B. **It is the intention of the Contract that conduit, sleeves, thimbles, and chases for the mechanical and electrical work be installed in new concrete, masonry or stud wall work as the work progresses.** The mechanical and electrical subcontractors shall respectively install the required conduit, sleeves and thimbles in concrete forms and in masonry work and shall inform the Contractor of the size and location of any required chases to be formed in the concrete and masonry work. If this procedure is not followed, the mechanical and electrical subcontractors shall do all cutting of new concrete and masonry work required to install their work.

C. Cutting of new work shall be held to the minimum necessary and shall be done neatly. The Contractor shall be responsible for the proper patching and finishing of all cut work whether or not cut by his own workmen or by subcontractors.

D. Furr out walls or ceilings where necessary for the new work. Thicken walls as required to accommodate wall-mounted equipment including but not limited to electrical panel boxes, fire extinguisher cabinets, communications, security system, and fire alarm panels. Consult with the Architect about any furr outs not shown on the drawings to keep furr outs to a minimum.

1.03 PROJECT COORDINATION:

A. Large Equipment: When possible, equipment which is to be installed in the building that may be too large to pass through doorways, shafts, or other restrictions shall be brought on the job and placed in the proper location before the enclosing structure is completed, otherwise, arrange with other Contractors to permit access at a later date, at no additional cost to the Owner.

PART II PRODUCTS

NOT USED

PART III EXECUTION

NOT USED

End of Section

SECTION 01 33 00

SUBMITTALS

PART I GENERAL

1.01 GENERAL:

A. Work Included:

1. Wherever possible, throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards.

2. To ensure that the specified products are furnished and installed in accordance with the design intent, procedures have been established for advance submittal of design data and for its review or rejection by the Architect.

3. Shop drawings, product data and samples will be required for items listed hereinafter in the various sections of the specifications. The Architect reserves the right to request samples of proposed substitutions for materials or equipment specified whether or not samples of the materials and equipment specified are called for.

1.02 RELATED DOCUMENTS:

A. Applicable provisions of the General Conditions, Supplementary Conditions, and Division 1, General Requirements, apply to the work under this section.

1.03 DESCRIPTION OF REQUIREMENTS:

A. The types of submittals controlled by these General Requirements include shop drawings, product data, samples and miscellaneous work-related submittals. The individual submittal requirements are specified in applicable section for each unit of Work.

B. Definitions: the work-related submittals of this section, in addition to the definitions of the General Conditions and elsewhere in the Contract Documents for the requirements of administrative submittals.

1. **Shop drawings** include custom-prepared data of all forms including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements, and similar information not in standard printed form applicable to other projects.
2. **Product data** includes standard printed information on materials, products and systems, not custom-prepared for this project, other than the designation of selections from available choices.
3. **Samples** include both fabricated and unfabricated physical samples of materials, products and Work; both as complete units and as smaller portions of units of Work; either for limited visual inspection or (where indicated) for more detailed testing and analysis.
4. **Miscellaneous submittals** related directly to the Work (non-administrative) include warranties, guarantees, maintenance agreements, workmanship bonds, quality testing and certifying reports, copies of industry standards, record drawings, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the Work and not defined as shop drawings, product data or samples.

1.04 GENERAL SUBMITTAL REQUIREMENTS:

A. Coordination and Sequencing: Coordinate the preparation and processing of submittals with the performance of the Work so that Work will not be delayed by submittals. Coordinate and sequence different categories of submittals for the same Work, and for interfacing units of Work, so that one will not be delayed for coordination with another. Do not proceed with purchasing, fabrication and delivery of work related to a submittal until submittal procedure has been successfully completed.

B. Preparation of Submittals: provide permanent marking on each submittal to identify it by project, date, Contractor, subcontractor, submittal name and similar information to distinguish it from other submittals. Show Contractor's approval marking prior to Architect's design intent review. Package each submittal appropriately for transmittal and handling. Submittals which are received directly from sources other than through the Contractor's office will be returned "without action".

C. The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect's approval of submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submission and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for error or omissions in the submittals by the Architect's approval thereof.

D. Verbal discussion between the Contractor and the Owner or the Architect of a proposed deviation and any subsequent agreements thereto shall not be considered valid unless confirmed in writing by the Owner or the Architect.

E. The Contractor shall direct specific attention, in writing or on resubmitted submittals, to revisions other than those requested by the Architect on previous submittals.

F. Delivery: All submittals shall be accompanied by a letter of transmittal containing an enumeration and description of the submittals and, unless otherwise specified, shall be delivered to the Architect. **The transmittal letter shall indicate whether the submittal is for a product as specified; is a pre-approved substitution; or is a request for substitution offered with supporting documentation in accordance with the Contract Documents.**

Unless directed otherwise, all submittals shall be delivered to:

Shannon Elliott
selliott@jainc.com
Johnson Architecture Inc
2240 Sutherland Ave
Suite 105
Knoxville TN 37919

1.05 SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST:

A. Within 30 days of receipt of a notice to proceed and prior to submitting any shop drawings or requests for payment, the Contractor shall submit a list of Subcontractors and Major Material Suppliers on the form provided in this Project Manual. The form shall list all Subcontractors and suppliers for the project providing material and or labor whose dollar value equals or exceeds Five Thousand dollars ($5,000).

1.06 SCHEDULE OF VALUES:

A. The schedule of values specified in Subparagraph 9.2.1 of the General Conditions shall be divided into not less than one line item for each section of the specifications (except Division 1

sections). Coordinate line items in the schedule of values with portions of the contract documents which identify units or subdivisions of work. Specifically, correlate with the project manual table of contents. Divide major subcontracts into individual cost items. Submit Schedule of Values within 20 days after execution of the Contract.

1. Where applications for payment are likely to include products purchased or fabricated but not yet installed, provide individual line items for material cost, installation cost, and other applicable phases of completion.
2. Provide separate line items for each allowance included in the Contract price.

1.07 APPLICATIONS FOR PAYMENTS:

A. Applications for payments shall be submitted on AIA Document G702, Application and Certificate for Payment, supported by AIA Document G702A, continuation sheet, and by separate lists of materials stored at the site and materials stored off the site. Three (3) original notarized copies of Applications for Payment shall be submitted.

1.08 CONTRACTORS PROGRESS SCHEDULE:

A. Prepare a fully developed, horizontal bar-chart type, contractor's progress schedule. Submit within twenty (20) days after the date established for Commencement of the Work.

B. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicated in the Schedule of Values.

C. As work progresses, place a contrasting mark in each bar to indicate Actual Completion.

D. Prepare the schedule on a sheet or series of sheets, of paper of sufficient width to show data for the entire construction period.

E. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.

F. Coordinate the Contractor's Progress Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.

G. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.

H. Revise the schedule monthly. Issue the updated schedule concurrently with the Application and Certification for Payment.

1.09 REVIEW OF DELEGATED ENGINEERING DOCUMENTS:

A. Delegated Engineer: A professional engineer who undertakes a specialty service and provides services or creative work regarding a portion of the engineering project such as a fabricator or contractor so long as the engineer acts as an independent consultant or through a duly qualified engineering corporation. The delegated engineer is the engineer of record for that portion of the project.

B. Documents prepared by a delegated engineer shall bear the name and business address of the delegated engineer on the engineering documents. When such documents are issued for

preliminary or conceptual use, the engineer shall clearly note the intended purpose of such documents.

C. Documents prepared by the delegated engineer shall be submitted to the engineer of record for review for compliance with engineering requirements and to confirm the following:

1. That the delegated engineering documents have been prepared by an engineer licensed and registered in the state of project construction.
2. That the delegated engineering documents of the delegated engineer conform with the intent of the engineer of record and meet the written criteria.
3. That the effect of the delegated engineer's work on the overall project generally conforms with the intent of the engineer of record.

1.10 SHOP DRAWINGS:

A. General: See Paragraph 3.12 of the General Conditions for provisions pertaining to shop drawings.

B. Preparation of Shop Drawings: Submit newly prepared information drawn accurately to scale sufficiently large to show all pertinent features of the item and its method of connection to the Work. **Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings**. Standard information prepared without specific reference to the Project is not a Shop Drawing. **Provide a space approximately 4 inches by 5 inches on the label or beside the title block on Shop Drawings to record the Architect's approval markings and recording action taken. Do not allow shop drawing copies without appropriate final review markings by the Architect or Engineer to be used in connection with the Work.**

C. Identification: All submittals shall be clearly identified with the **name of the project, the supplier's name, the Contractor's name, and the location of material or equipment in the building. All shop drawings shall be dated and numbered.**

D. Contractor's Review: Shop drawings submitted without evidence that they have been reviewed by the Contractor, as specified in Paragraph 3.12 of the General Conditions, or without proper identification as specified herein, will be returned to the Contractor without action by the Architect and shall be properly resubmitted. **When the phrase "by others" appears on a shop drawing, the Contractor shall indicate on the shop drawing who is to furnish the material or operation so noted, before submitting the drawing. By approving and submitting submittals, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.**

E. Coordination of Submittals: Prior to submittal for Architect's review, use all means necessary to fully coordinate all material, including, but not limited to, the following procedures:

1. Determine and verify all field dimensions and conditions, catalog numbers, and similar data.
2. Coordinate as required with all Trades and with all public agencies involved.
3. Secure all necessary approval from public agencies and others; signify by stamp or other means that all require approvals have been obtained.
4. Clearly indicate, in writing, all deviations from the Contract Documents.
   Additional copies of approved shop drawings shall be furnished as required for coordination of the work of the various trades.

F. Number of Shop Drawings Required:

1. One (2) hard-copy print and one electronic file copy of the entire submittal, shall be submitted of each submittal. The hard-copy shall be bound as a single entity for each submittal. ALL information present in the hard-copy, and no information absent from the hard-copy, shall be contained in a single electronic file as a single submittal.
2. After the submittal has been reviewed and stamped, a copy of the electronic file will be kept at the office of the Architect, a copy of the electronic file will be kept at the office of the Engineer.
3. One (1) reviewed copy of the electronic file will be returned to the Contractor, from which he shall make as many hard-copies as he feels is needed for the prosecution of the Work.
4. The Architect will not furnish additional copies to the Contractor.

G. Architect's Review of Submittals: The Architect/Engineer shall review and approve or take other appropriate action on the Contractor submittals, such as shop drawings, product data, samples and other data, which the Contractor is required to submit, but only for the limited purpose of checking for conformance with the design concept and the information shown in the Construction Documents. This review shall not include review of the accuracy or completeness of details, such as quantities, dimensions, weights or gauges, fabrication processes, construction means or methods, coordination of the work with other trades or construction safety precautions, all of which are the sole responsibility of the Contractor. The Architect/Engineer's review shall be conducted with reasonable promptness while allowing sufficient time in the Architect/Engineer's judgment to permit adequate review. Review of a specific item shall not indicate that the Architect/Engineer has reviewed the entire assembly of which the item is a component. The Architect/Engineer shall not be responsible for any deviations from the Construction Documents not brought to the attention of the Architect/Engineer in writing by the Contractor. The Architect/Engineer shall not be required to review partial submissions or those for which submissions of correlated items have not been received.

1. The Architect shall provide 2 reviews of submittals as part of the scope of work. Additional reviews required by failure of the Contractor to make indicated corrections or submit an acceptable product will be billed to the Contractor at the Architect’s standard hourly rate.

H. Time Required for Architect's Review: Shop drawings shall be submitted in time to allow **not less than two weeks for processing by the Architect, plus an additional week for submittals requiring review by an engineer including mechanical, electrical, structural and civil engineering or those items requiring review by a consultant such as kitchen equipment, detention facility equipment and/or acoustical consultants.**

1.11 PRODUCT DATA:

A. General: See Paragraph 3.12 of the General Conditions for provisions pertaining to shop drawings.

B. Collect the required data into one submittal for each material, product or system; and mark each copy to show which choices and options are applicable to the project. Include manufacturer’s standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and special coordination requirements. Maintain one set of product data (for project site, available for reference by the Architect, Engineer or others).

C. The Architect will require a minimum of two (2) copies to be submitted of Product Data which has not been originally prepared on copyable material. The Architect will retain one copy, one copy will be returned to the Contractor. Therefore, if the Contractor desires more than one (1) copy

with one copy returned to him, he must add to the minimum number of copies required to be submitted.

D. Information not exclusively pertinent to the Project shall be deleted so that there is no possible area of confusion as to what product, series or model is to be examined. The Architect or Owner will not take responsibility for having examined a product that was not intended by the Contractor to be judged.

1.12 SAMPLES AND MOCKUPS:

A. Samples and mockups shall faithfully represent the product or the assembly as it is proposed to be installed. This shall include, but not be limited to, materials, finishes, method of construction or assembly, relationship to adjacent construction, method of attachment to adjacent construction, plus any electrical or mechanical connection that are required for the product or assembly to function. Include “range” samples (not less than 3 units) where variations occur, and identify each unit of each set.

B. All samples shall have a label or tab containing the required information firmly affixed thereto.

C. Unless the precise color and pattern is specifically described in the Contract Documents, whenever a choice of color or pattern is available in specified product submit accurate color charts and pattern charts to the Architect for his review and selection. Provide full sets of optional samples where Architect’s selection is required. Prepare samples to match the Architect’s sample where so indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards.

D. Samples and color charts shall be physical specimens of materials or colors proposed to be provided. Selections and approval of samples will be made by the Architect from these submitted samples and color charts, without increase in costs to the Owner or Architects. Should be Contractor desire a sample returned, he shall submit a sufficient number in order for the Architect to retain one (1) sample and return the remainder to the Contractor.

E. In order for the Architect to make a color schedule as quickly as possible and to avoid delivery and pricing problems, the Contractor shall be required to submit all items that require a color selection within 40 days of the Notice to Proceed. Delivery and pricing problems that develop because an item was not submitted within the forty (40) day time limit, shall be the sole responsibility of the Contractor and not that of the Owner.

F. The color selection on any one item will not be made until after samples of all items that require a color selection have been submitted.

1.13 AS BUILT SURVEY:

A. Contractor shall provide an as-built topographic survey of the work as part of Close-out Documents.

1. Show size, location and depth of buried tanks or structures if possible.

2. Provide topographic survey at one (1) foot contours.

3. Locate all on-site utilities:

a. Top and invert of all sanitary and storm sewers installed on site. Showpipe size and materials, including pipes to daylight and/or detention ponds, on or off site (give direction of flow).

b. All gas, water, electric, sewage installed on site – indicate size, depth, pressure and materials.

4. Locate any and all fire hydrants installed on the site.

5. Give benchmark elevation and location and state the source of the vertical datum. Tie benchmark to survey provide as part of Construction Documents.

6. Provide topography 50 feet beyond extent of grading work performed on site.

7. Provide name, address and phone number for the Building Department officials approving installation and connection of utility lines to public utilities and the name, address and phone number of Utility companies having jurisdiction over property

8. Provide progress print to Architect prior to supplying vellum.

9. Provide one (1) print of stamped and signed survey to Architect upon completion.

10. Provide a digital file of final survey in an AutoCAD .dwg or .dxf format.

11. Tie site to locally established horizontal and vertical datum in relation to state plain coordinates if within 200 feet of site and/or if site is within a designated flood hazard plain.

1.14 ARCHITECT'S ACTION:

A. The stamps of the Architect on returned shop drawings, product data and samples shall be interpreted as follows:

1. Received: Acknowledges receipt. No action taken.
2. Reviewed, No Exceptions Taken: No corrections. Proceed with the work.
3. Furnish as Noted: May proceed with work as noted; shop drawings bearing this stamp must submit revised and resubmitted for record.
4. Revise and Resubmit: No work shown shall be fabricated or furnished until shop drawings have been revised and resubmitted for further checking or approval.
5. Rejected: Work shown is not in accordance with Contract requirements and is rejected. Make new submittals.
6. Submit Specified Item: No substitutions permitted for this item. Make new submittals.

1.15 SUBMITTAL SCHEDULE:

A. After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for submittal of the Contractor's Construction Schedule.

B. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Contractor's

C. Prepare the schedule in chronological order. Provide the following information for each submittal.

Scheduled date for the first submittal.
Related Section Number
Submittal category (Shop Drawing, Product Data, or Sample)
Name of the subcontractor
Description of the part of the Work covered
Scheduled date for Architect's final release or approval.

D. Following approval of initial submittal, print and distribute copies to the Architect, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

E. Revise the schedule monthly and issue the updated schedule concurrently with each Application and Certificate for Payment.

1.16 SUBMITTAL SEQUENCE:

A. The right is reserved by the Architect to examine submittals and samples in a proper sequence that reflects the logical sequence of erection, installations, and proper assembly. Submittals of products or materials that are the responsibility of separate Trades yet must be assembled in conjunction one with another, shall be submitted at the same time so that they may be examined all together. Should these not be submitted simultaneously, the Architect reserves the right to hold one set while awaiting the arrival of other submittals.

B. All submittals within the responsibility of one Trade must be submitted at one time together (i.e. millwork). Numerous submittals of one product or item of construction over a period of time is not acceptable. In the event of this occurrence, the Architect will hold the submittal data arriving first until the last of the material has arrived. Then, and only then, will he make his examination.

1.17 TIMING OF SUBMITTALS:

A. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittals, and for placing orders and securing delivery.

B. Costs of delays occasioned by tardiness of submittals may be back-charged as necessary and shall not be borne by the Owner.

1.18 RECORD DRAWINGS:

A. In addition to the record drawings specified in Paragraph 3.11 of the General Conditions, the Contractor shall assure that the record drawings for the mechanical, plumbing, fire protection and electrical work, as specified under Division 15 and 16 respectively, are properly maintained by his subcontractor and upon completion of the work shall deliver them to the Architect for the Owner.

1.19 CONTRACT CLOSE-OUT SUBMITTALS:

A. As a precedent to final acceptance of the work and issuance of Certificate of Final Payment, including the Release of Retainage, certain submittals shall be made as specified in the various sections of the specifications. All such submittals shall be delivered to the Architect, in the form and number of copies specified, prior to or with the Contractor's request for final payment. Submittals shall include but not be limited to:

1. General Contractor's Affidavit, Waiver and Release of Lien Statements and Consent of Surety, to final payment **as well as release of lien statements from all subcontractors and major material suppliers** as specified in Subparagraph 9.10.2 of the General Conditions. **These documents shall be addressed to the Owner, and shall be original signed documents and not reproduced copies. Two (2) sets of these drawings shall be submitted**.
2. Written guarantees and warranties as specified in the various other sections of the specifications.
3. Record drawings as specified in the General Conditions and in Divisions 15 and 16.
4. One copy of each final approved shop drawing submitted during the course of the project.

5. Three copies of operation and maintenance data for mechanical equipment and electrical equipment.
6. Letter stating that to the best of the Contractor's knowledge, no asbestos containing materials or other Work hazardous materials or products as currently defined in the Resource Conservation and Recovery Act of 1976 (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), or Environmental Protection Agency (EPA) regulations, rules, or requirements, as amended
7. Contract Close-Out Submittals, except for record drawings, shall be submitted in commercial quality three ring binders with durable plastic covers. Identify the project on the face and side of the binders. Provide a cover sheet giving complete Project Title, Contractor's and Architect's name, address, phone number, name of project superintendent, and related general information. Include a Table of Contents to identify material in the Project Data Binders and a complete listing of subcontractors and material suppliers. Provide copies of all Certificates, Warranties and related documents as well as Product Data, Maintenance and Operation Data and related information required by the Contract Documents or furnished with items included in the Project. Two (2) sets of these documents shall be submitted.

PART II PRODUCTS – NOT USED

PART III EXECUTION – NOT USED

End of Section

Submittal Cover Sheet **Submittal No.:** _____

Contractor: _____ **Date:** _____

_____

_____ **Phone:** _____

_____

Fax: _____

Project Manager: _____

Email: _____

Project Title: _____ **Architect's Comm. No.:** _____

Spec Section Title: _____ **Section No.:** _____

Sub / Supplier: _____ **Phone:** _____

_____

Product as Specified YES NO
If not as specified attach Substitution Request Form

Remarks: _____

_____

_____

_____

_____ **Contractor's Review Stamp**

_____

_____

_____

_____

_____

_____

_____

SECTION 01 35 00

SPECIAL PROJECT PROCEDURES:

PART I GENERAL

1.01 PROGRESS SCHEDULE:

A. In addition to the progress schedule required by the General Conditions, the Contractor shall also submit his proposed scheme of work for approval, describing proposed methods and sequences of work from beginning to completion of the work and their correlation with the Owner's requirements.

B. When the Contractor's proposed sequence of work has been approved by the Owner, it shall become the time schedule for the work and shall be adhered to as closely as possible by both the Contractor and the Owner, except that mutually agreeable modifications may be made from time to time to meet unforeseen exigencies.

1.02 TIME OF PERFORMING WORK:

A. Generally, the Contractor will be permitted to conduct his work in the building and on the premises during his regular working hours.

B. The building must have the HVAC system operational and maintained at a constant temperature prior to installing any building finishes, except metal support systems.

1.03 OBSTRUCTIONS:

A. All obstructions encountered during the construction of the Contract work shall be overcome by the Contractor by removal or alteration of work in place, by adjustments in the new work, or by temporary removal and reinstallation of existing work.

1.04 CLEANING UP:

A. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

B. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

C. Exposed Surfaces in Finished Areas: Clean exposed surfaces

D. Upon completion of the work, remove spots, stains, dirt, and dust from finished surfaces, both new and existing, including the surfaces of all existing machinery, equipment, and exposed piping that have been soiled by the construction. Protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

E. Clean and mop hard surface flooring and resilient flooring and vacuum clean carpet flooring

F. Wash all glass and clean plumbing fixtures, lighting fixtures, and mechanical equipment.

G. Comply with all special cleaning instructions contained in the various other sections of the specifications.

H. Protect new and existing surfaces from the growth and spread of mold and mildew. If mold and mildew occur, notify Architect prior to proceeding. Retain qualified testing agency to document

and direct remediation. Remediate or replace surfaces to stop the growth and spread of mold and mildew as deemed necessary by a qualified testing agency acceptable to the Contractor, Owner and Architect.

1. Pay for necessary testing and perform all abatement work required to remedy condition.

1.05 INSPECTION OF WORK IN PLACE:

A. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities. The architect is to be given advanced notification for inspection of Structural, Mechanical, Plumbing, and Electrical work prior to said work being covered.

B. Contractor shall give architect advanced notification for final inspection punch list prior to Owner occupying space.

1.06 SMOKING AND FIRE PRECAUTIONS

A. No fire, or use of any fire, or explosion-producing tools or equipment will be permitted on the property

B. This facility is a designated non-smoking facility. Smoking will not be permitted in the facility or within 20 feet of any entrance.

PART II PRODUCTS – NOT USED

PART III EXECUTION – NOT USED

End of Section

SECTION 01 40 00

QUALITY CONTROL

PART 1 GENERAL

1.01 Quality Control is defined as testing and inspection performed by/or under the direction of the Contractor to ensure materials and construction meet the requirements of the Contract Documents and Specifications.

1.02 TESTS:

A. Engage inspection and test service agencies, including independent testing laboratories, which comply with “Guidelines for Effective Practice for Materials Engineering Laboratories” by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

B. Tests required to establish compliance with the Contract requirements for quality control shall be made by a testing agency acceptable to the Contractor, the Owner and the Architect with reports certified by the laboratory and furnished in duplicate to the Architect with a copy to the Contractor.

C. Representatives of the testing agency and monitoring shall have access to the work at all times. The Contractor shall provide facilities for such access and samples as necessary so that the testing agency may properly perform its function.

D. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to the following:

Name of testing agency or testing laboratory.
Dates and locations of samples and test or inspections.
Names of individuals making the inspection or test.
Complete inspection or test data.
Test results
Interpretations of test results.
Notation of significant ambient conditions at the time of sample taking and testing.
Comments or professional opinion as to whether inspected or tested work complies with requirements of the contract documents.
Recommendations on retesting, if applicable.

E. Non-Compliant Inspection/Test Results: Within 24 hours of inspection/test being performed, notify Architect/Engineer of-Record, and the Contractor of any non-conforming/non-compliant inspections/tests. Copies of successful retests of the originally non-conforming/non-compliant work shall be submitted to the Architect/Engineer-Of-Record and the Contractor.

F. Project Closeout: the Contractor shall certify to the Architect of Record that the required quality control services, as required by this section and the contract documents have been performed and that all results indicate compliance with requirements.

1.03 COST OF TESTS:

A. The cost of the services of the testing agency and monitoring shall be paid by the Contractor. When the tests indicate noncompliance with the Contract requirements, any subsequent and retesting occasioned by noncompliance shall be performed by the same testing agency and the costs shall be borne by the Contractor.

1.04 NOTIFICATIONS OF THE ARCHITECT:

A. Notify architect within 24 hours before any work is completed for areas as described herein. If the architect is not notified as stated above and the contractor proceeds with the work, the architect shall have authority to direct the contractor to remove part or all of the installed materials at the contractor's expense for a detailed observation.

B. The Architect shall be notified at the following points of work:

1. Footing bottoms and concrete reinforcement prior to pouring any concrete.

2. Waterproofing/Damp-proofing prior to any backfilling work.

3. Water drainage test on sloped concrete floors prior to finish floor materials installed.

4. Thru-wall flashing installation and mortar mix prior to installing any masonry.

5. Completed structural steel erection before floor slabs are poured.

6. Mechanical and Electrical systems above ceiling inspection prior to installation of finish ceiling material.

C. The respective contractor and/or subcontractor shall correct any deficiencies that may be observed. Construction work observations or lack there of by the architect does not relieve the contractor and/or subcontractor from any liability of faulty workmanship that may have occurred or may occur at a later date.

1.05 OTHER TESTS:

A. See provisions of the General Conditions regarding tests required by governing authorities.

B. The provisions of Divisions 22-23 and 26 for tests required for mechanical and electrical work.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 REPAIR AND PROTECTION:

A. Upon completion of inspection, testing, sample taking, and similar services, repair damaged work and restore substrates and finishes to eliminate all deficiencies. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

End of Section

SECTION 01 45 00

SPECIAL INSPECTIONS

PART I GENERAL

1.01 GENERAL:

A. Special Inspections is defined as third party testing and monitoring of materials and construction as indentified in this section. Items requiring testing, inspection or monitoring that are not identified herein will be as required in Section 01 40 00.

B. Conformance with the design intent of the contract documents shall be controlled by field testing during construction and laboratory testing prior to start of construction as specified in the various technical sections of this project manual and in accordance with the requirements of the Authority Having Jurisdiction (the Building Department)

1. Special Inspection is the monitoring of the materials and workmanship critical to the integrity of the building structure. It is a review of the work of the contractor's and their employees to ensure that the approved plans and specifications are being followed and that the relevant codes and referenced standards are being observed. The Special Inspection process is in addition to the inspections conducted by the Building Department or Authority Having Jurisdiction.
2. Certain Special Inspections are required by the Design Professional in Responsible charge. Additional Special Inspections may be required by the Building Department or Authority Having Jurisdiction. In these instances, the Building Department is the final determining entity as to the specific requirements for these Special Inspections.
3. Contractors shall include in their price, any costs associated with coordination with the Special Inspector and Special Inspections Coordinator hired by the Owner. In the event that any Designer required testing is waived, a Change Order will be issued crediting the cost of those tests back to the Owner.

1.02 TESTS:

A. The following tests/inspections will be performed as Special Inspections according to the requirements of Chapter 17 of the International Building Code, the tables and/or notes in the Contract Documents and items listed in the Specifications.

1. Site Grading – all grading including building pad preparation
2. Concrete – all concrete construction except sidewalks, mechanical/electrical pads
3. Structural Steel
4. Lateral Force Resisting Systems
5. Foamed in Place Insulation
6. Sprayed Acoustical Insulation
7. Applied Fireproofing
8. Intumescent Fire Protection
9. Other items as listed on Drawings that are not listed above
10. Other items as listed in Specifications that are not listed above

B. Special Inspections will be conducted by a Third Party Agency retained by the Owner.

C. Inspection and testing service agencies, including independent testing laboratories, shall comply with Qualifications of Inspectors and Testing Technicians as stated in the Statement of Special Inspections and "Guidelines for Effective Practice for Materials Engineering Laboratories" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

D. Reports shall be certified by the testing agency and furnished to the Special Inspections Coordinator and the Architect with a copy to the Contractor.

E. Representatives of the testing agency and monitoring shall have access to the work at all times. The Contractor shall provide facilities for such access and samples as necessary so that the testing agency may properly perform its function.

F. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to the following:

Name of the Jurisdiction having authority
Building Permit No.
Project title and address
Name of testing agency or testing laboratory.
Type of inspection performed
Dates and locations of samples and test or inspections.
Names of individuals making the inspection or test.
Complete inspection or test data.
Test results
Interpretations of test results.
Notation of significant ambient conditions at the time of sample taking and testing.
Comments or professional opinion as to whether inspected or tested work complies with requirements of the contract documents.
Itemization of items requiring corrective action.
Recommendations on retesting, if applicable.

G. Non-Compliant Inspection/Test Results: Within 24 hours of inspection/test being performed, notify Architect/Engineer of-Record, and the Contractor of any non-conforming/non-compliant inspections/tests. Copies of successful retests of the originally non-conforming/non-compliant work shall be submitted to the Architect/Engineer-Of-Record and the Contractor.

H. Project Closeout: the Special Inspector shall certify to the Professional in Responsible Charge that the required Special Inspections, as required by this section and the contract documents have been performed and that all results indicate compliance with requirements.

1.03 COST OF RETESTING:

A. The cost of the services of the testing agency and monitoring shall be paid by the Owner. When the tests indicate noncompliance with the Contract requirements, any subsequent and retesting occasioned by noncompliance shall be performed by the same testing agency and the costs shall be borne by the Contractor.

1.04 NOTIFICATIONS OF THE ARCHITECT:

A. Notify architect within 24 hours before any work is completed for areas as described in paragraph 2 below. If the architect is not notified as stated above and the contractor proceeds with the work, the architect shall have authority to direct the contractor to remove part or all of the installed materials at the contractor's expense for a detailed observation.

B. The Architect shall be notified at the following points of work:

1. Footing bottoms and concrete reinforcement prior to pouring any concrete.
2. Waterproofing/Damp-proofing prior to any backfilling work.
3. Water drainage test on sloped concrete floors prior to finish floor materials installed.
4. Thru-wall flashing installation and mortar mix prior to installing any masonry.

5. Completed structural steel erection before floor slabs are poured.
6. Installation of Fire Protection
7. Mechanical and Electrical systems above ceiling inspection prior to installation of finish ceiling material.

C. The respective contractor and/or subcontractor shall correct any deficiencies that may be observed. Construction work observations or lack there of by the architect does not relieve the contractor and/or subcontractor from any liability of faulty workmanship that may have occurred or may occur at a later date.

1.05 DUTIES AND RESPONSIBILITIES OF THE PARTIES:

A. Special Inspector:

1. Signify presence at jobsite. Special inspectors should notify contractor personnel of their presence and responsibilities at the jobsite. If required by the building official, they shall sign in on the appropriate form posted with the building permit.

2. Observe assigned work. The special inspector shall observe assigned work for conformance with the building department approved (stamped) design drawings and specifications and applicable workmanship provisions of the International Building Code. Architect/engineer reviewed shop drawings may be used only as an aid to inspection.

3. For continuous special inspection, the special inspector shall be on site at all times work is in process observing the work requiring continuous special inspection. Periodic inspections, if any, must have prior written approval based on a separate written plan reviewed and approved by the registered design professional in responsible charge. Periodic inspection is intended to mean that the inspector at periodic times inspects all work performed but is not required to “witness” the work being performed.

4. Report nonconforming items. The special inspector shall bring nonconforming items to the immediate attention of the contractor and note all such items in the daily report. If any item is not resolved in a timely manner or corrective action is not incorporated in the work, the special inspector shall immediately notify the building department by telephone or in person, notify the registered design professional in responsible charge and post a discrepancy notice. Any nonconforming items not corrected within 14 consecutive calendar days shall be issued to the Design Professional in Responsible Charge and the Building Department as a discrepancy notice.

5. Provide timely reports. The special inspector should complete written inspection reports for each inspection visit and provide the reports on a timely basis determined by the building official and to the Design Professional in Responsible Charge. The special inspector or inspection agency shall furnish these reports directly to the building official, registered design professional in responsible charge and others as designated. These reports should be organized on a daily format and may be submitted minimum weekly to the Design Professional in Responsible Charge and to the Building Official at his option.. Examples of daily and weekly report forms are included in Appendix A. These reports should include:

a. Description of daily inspections and tests made with applicable locations;
b. Listing of all nonconforming items;

c. Report on how nonconforming items were resolved or unresolved as applicable.
d. Itemized changes authorized by the architect, engineer and building official if not included in nonconforming items.

6. Submit final report. The special inspector or inspection agency shall submit a final signed report to the Design Professional and the building official stating that special inspection and testing requirements were fulfilled and reported and, to the best of his/her knowledge, in conformance with the approved design drawings, specifications, approved change orders and the applicable workmanship provisions of the International Building Code. Items not in conformance, unresolved items or any discrepancies in inspection coverage (i.e., missed inspections, periodic inspections when continuous were required, etc.) shall be specifically itemized in this report.

B. Owner:

1. The project owner, the Registered Design Professional in responsible charge or other entity as an agent of the owner is responsible for employing special inspection services. The special inspector/agency shall not be in the employ of the contractor, subcontractor or material supplier (see IBC Section 1704.1). In the case of an owner/contractor, the special inspector/agency shall be employed as specified by the building official.

C. Registered Design Professional in Responsible Charge:

1. Prepare special inspection program. The registered design professional in responsible charge shall list the items for which special inspection is required and shall indicate which, if any, items for which the IBC or the building official approves periodic inspection and the frequency of such inspection.
2. Respond to field discrepancies. The registered design professional in responsible charge shall respond to discrepancy notices issued by the special inspector.
3. Review shop drawings and submit design changes. The registered design professional in responsible charge shall acknowledge and approve shop drawings that may detail structural information, shall submit to the building official and to the special inspection agency written approval of any verbally approved deviations from the approved plans and shall submit revised plans for building official approval as required.

D. Special Inspections Coordinator:

1. Keep records on file of all inspections.
2. Furnish copies of inspection reports to the Building Official and the Registered Design Professional in Responsible Charge.
3. Verify acknowledgement by the Contractor for correction, of discrepancies reported by special inspectors.
4. If discrepancies reported by the Special Inspector are not corrected, verify reporting to the

E. Contractor:

1. Notify the special inspector. The contractor is responsible for notifying the special inspector or agency regarding individual inspections for items listed on the attached schedule and as noted on the building department approved plans. Adequate notice shall be provided so the special inspector has time to become familiar with the project.
2. Provide access to approved plans. The contractor is responsible for providing the special inspector access to approved plans.

3. Advise testing agency in advance of operations to allow for the assignment of testing personnel and testing.

4. Furnish labor to assist testing agency in obtaining and handling samples at the job site. Provide and maintain for the use of the testing agency adequate facilities for proper curing and storage of test specimens on the project site.
5. Retain special inspection records. The contractor is also responsible for retaining at the jobsite all special inspection records completed by the special inspector upon request.

F. Building Department:

1. Approve special inspection program. The building department will approve all special inspectors and special inspection requirements.
2. Enforce special inspection. Work requiring special inspection and the performance of special inspectors may be monitored by the building inspector. His/her approval must be obtained prior to placement of concrete, covering of structural steel or other similar activities in addition to that of the special inspector.
3. Review inspection reports. The building official should review special inspection progress and final reports.
4. Perform final inspection. The building official should perform the final inspection and approval for a project after the final special inspection report has been reviewed and approved.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 REPAIR AND PROTECTION:

A. Upon completion of inspection, testing, sample taking, and similar services, repair damaged work and restore substrates and finishes to eliminate all deficiencies. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

End of Section

SPECIAL INSPECTION AGREEMENT

Project Title: _____
Architect's Comm. No.: _____

Project Address:_____

Contractor: _____ **Date:** _____

_____ **Project Manager:** _____

_____

_____

Phone: _____ **Fax:** _____ **Email:** _____

PERMIT NUMBER: _____ DATE: _____

OWNER: _____

APPROVED TESTING LABORATORY: _____

PROJECTNAME:_____

To permit applicants of projects requiring special inspection and/or testing per Section 1704 of the International Building Code (IBC):

BEFORE A PERMIT CAN BE ISSUED: The owner, or the registered design professional in responsible charge, acting as the owner's agent, shall complete two (2) copies of this agreement and the attached Special Inspection and Testing Schedule, including the required acknowledgments. A preconstruction conference with the parties involved may be required to review the special inspection requirements and procedures.

APPROVAL OF SPECIAL INSPECTORS: Special inspectors may have no financial interest in the construction of projects for which they provide special inspection. Special inspectors shall be approved by the building department prior to performing any duties. Special inspectors shall submit their qualifications and are subject to personal interviews for prequalification. Special inspectors shall display approved identification, as stipulated by the building official, when performing the function of special inspector. Special inspection and testing shall meet the minimum requirements of International Building Code

Section 1704. The following conditions are also applicable:

DUTIES AND RESPONSIBILITIES OF THE SPECIAL INSPECTOR:

1. Signify presence at jobsite. Special inspectors should notify contractor personnel of their presence and responsibilities at the jobsite. If required by the building official, they shall sign in on the appropriate form posted with the building permit.

2. Observe assigned work. The special inspector shall observe assigned work for conformance with the building department approved (stamped) design drawings and specifications and applicable workmanship provisions of the International Building Code. Architect/engineer reviewed shop drawings may be used only as an aid to inspection.

For continuous special inspection, the special inspector shall be on site at all times work is in process observing the work requiring continuous special inspection. Periodic inspections, if any, must have prior written approval based on a separate written plan reviewed and approved by the registered design professional in responsible charge. Periodic inspection is intended to mean that the inspector at periodic times inspects all work performed but is not required to “witness” the work being performed.

3. Report nonconforming items. The special inspector shall bring nonconforming items to the immediate attention of the contractor and note all such items in the daily report. If any item is not resolved in a timely manner or corrective action is not incorporated in the work, the special inspector shall immediately notify the building department by telephone or in person, notify the registered design professional in responsible charge and post a discrepancy notice. Any nonconforming items not corrected within 14 consecutive calendar days shall be issued to the Design Professional in Responsible Charge and the Building Department as a discrepancy notice.

4. Provide timely reports. The special inspector should complete written inspection reports for each inspection visit and provide the reports on a timely basis determined by the building official and to the Design Professional in Responsible Charge. The special inspector or inspection agency shall furnish these reports directly to the building official, registered design professional in responsible charge and others as designated

These reports should be organized on a daily format and may be submitted minimum weekly to the

Design Professional in Responsible Charge and to the Building Official at his option.. Examples of daily and weekly report forms are included in Appendix A. These reports should include:

a. Description of daily inspections and tests made with applicable locations;

b. Listing of all nonconforming items;

c. Report on how nonconforming items were resolved or unresolved as applicable; and

d. Itemized changes authorized by the architect, engineer and building official if not included in nonconforming items.

5. Submit final report. The special inspector or inspection agency shall submit a final signed report to the Design Professional and the building official stating that special inspection and testing requirements were fulfilled and reported and, to the best of his/her knowledge, in conformance with the approved design drawings, specifications, approved change orders and the applicable workmanship provisions of the International Building Code. Items not in conformance, unresolved items or any discrepancies in inspection coverage (i.e., missed inspections, periodic inspections when continuous were required, etc.) shall be specifically itemized in this report.

B. Owner Responsibilities. The project owner, the registered design professional in responsible charge or an agent of the owner is responsible for employing special inspection services. The special inspector/agency shall not be in the employ of the contractor, subcontractor or material supplier (see IBC Section 1704.1). In the case of an owner/contractor, the special inspector/agency shall be employed as specified by the building official.

C. Registered Design Professional in Responsible Charge Responsibilities

1. Prepare special inspection program. The registered design professional in responsible charge shall list the items for which special inspection is required and shall indicate which, if any, items for which the IBC or the building official approves periodic inspection and the frequency of such inspection.

2. Respond to field discrepancies. The registered design professional in responsible charge shall respond to discrepancy notices issued by the special inspector.

3. Review shop drawings and submit design changes. The registered design professional in

responsible charge shall acknowledge and approve shop drawings that may detail structural information, shall submit to the building official and to the special inspection agency written approval of any verbally approved deviations from the approved plans and shall submit revised plans for building official approval as required.

D. Contractor Responsibilities

1. Notify the special inspector. The contractor is responsible for notifying the special inspector or agency regarding individual inspections for items listed on the attached schedule and as noted on the building department approved plans. Adequate notice shall be provided so the special inspector has time to become familiar with the project.

2. Provide access to approved plans. The contractor is responsible for providing the special inspector access to approved plans.

3. Retain special inspection records. The contractor is also responsible for retaining at the jobsite all special inspection records completed by the special inspector upon request.

E. Building Department Responsibilities

1. Approve special inspection program. The building department shall approve all special inspectors and special inspection requirements.

2. Enforce special inspection. Work requiring special inspection and the performance of special inspectors shall be monitored by the building inspector. His/her approval must be obtained prior to placement of concrete, covering of structural steel or other similar activities in addition to that of the special inspector.

3. Review inspection reports. The building official should review special inspection progress and final reports.

4. Perform final inspection. The building official should perform the final inspection and approval for a project (see IBC) after the final special inspection report has been reviewed and approved.

ACKNOWLEDGMENTS

I have read and agree to comply with the terms and conditions of this agreement.

Owner:

_____By: _____Date: _____

Project Engineer/Architect:

_____By: _____Date: _____

Special Inspections Coordinator (As designated by the Owner):

_____By: _____Date: _____

Geotechnical Engineer:

_____By: _____Date: _____

Contractor:

_____By: _____Date: _____

Special Inspector or Inspection Agencies:

_____By: _____Date: _____

_____By: _____Date: _____

_____By: _____Date: _____

_____By: _____Date: _____

_____By: _____Date: _____

_____By: _____Date: _____

ACCEPTED FOR THE BUILDING DEPARTMENT

By: _____ Date: _____

SPECIAL INSPECTION DAILY REPORT

City/County of _____ Permit No.:_____ Date :_____

Project Name/Address: _____

Inspection Type(s)/Coverage: _____

_____

Continuous Periodic; frequency: _____

Inspections made, including locations: _____

_____

_____

_____

_____

_____

_____

_____

_____

Tests performed: _____

_____

_____

_____

_____

Items requiring 1) Correction, 2) Correction of previously listed items and 3) Previously listed uncorrected items: _____

_____

_____

_____

Changes to approved plans authorized by registered design professional in responsible charge: _____

_____

_____

_____

_____

Comments: _____

_____

_____

_____

_____

To the best of my knowledge, work inspected was in accordance with the building department approved plans, specifications and applicable workmanship provisions of the IBC except as noted above.

Signed: _____ Inspection Agency: _____

Print full name: _____ ID Number: _____

SPECIAL INSPECTION DISCREPANCY NOTICE

City/County of _____ Permit No.:_____ Date :_____

Project Name/Address: _____

Inspection Type(s)/Coverage: _____

_____

Continuous Periodic; frequency: _____

Notice delivered to: Contractor Engineer/Architect Building Department

The following discrepancies require correction and inspection approval prior to proceeding with this phase of the work:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Signed: _____ Inspection Agency: _____

Print full name: _____ ID Number: _____

DO NOT REMOVE THIS NOTICE

Post with building permit inspection record card

SPECIAL INSPECTION WEEKLY REPORT

City/County of _____ Permit No.:_____ Date :_____

Project Name/Address: _____

Inspection Type(s)/Coverage: _____

_____

Continuous Periodic; frequency: _____

Total inspection time each day:

Dates

Hours

Inspector

Inspections made, including locations: _____

_____

_____

_____

_____

_____

Tests performed: _____

_____

_____

_____

Items requiring 1) Correction, 2) Correction of previously listed items, and 3) Previously listed uncorrected items: _____

_____

_____

_____

Changes to approved plans authorized by registered design professional in responsible charge:_____

_____

_____

_____

Comments: _____

_____

_____

_____

To the best of my knowledge, work inspected was in accordance with the building department approved plans, specifications and applicable workmanship provisions of the IBC except as noted above.

Signed: _____ Inspection Agency: _____

Print full name: _____ ID Number: _____

cc: Building Department

Engineer/Architect

SPECIAL INSPECTION FINAL REPORT

City/County of _____ Permit No.:_____ Date: _____

Attention: _____

Project Name/Address: _____

_____

In accordance with the International Building Code, special inspection has been provided

for the following items:

_____

_____

_____

_____

_____

_____

_____

_____

Based upon inspections performed and our (my) substantiating reports, it is our (my) professional judgment that, to the best of our (my) knowledge, the inspected work was performed in accordance with the approved plans, specifications and applicable workmanship provisions of the International Building Code.

Signed: _____ Inspection Agency: _____

Print full name: _____ ID Number: _____

or Agency Responsible Engineers stamp:

cc: Client/Project Owner

Engineer/Architect

STAMP

SPECIAL INSPECTION RECORD

Inspection Agency: _____

City of _____ Project Address: _____

Project Title: _____ Building Permit No.: _____

NOTE: Each special inspector shall complete for each day's inspection. Post this card adjacent to building permit inspection report card. Weekly reports to be submitted by each special inspection/inspection agency to the building department.

When attached to the job inspection record card, this card becomes a part of the inspection record.

INSPECTION TYPE	SPECIAL INSPECTOR	ID NO.	DATE	NOTES	TIME	
					ARR	LEFT

SECTION 01 50 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 UTILITIES SERVICES FOR CONSTRUCTION PURPOSES:

A. The Contractor shall provide all necessary temporary utilities as required for construction purposes. The utility costs will be paid by the Contractor.

B. The Contractor shall furnish and install all temporary piping and wiring required for the use of these services during construction and upon completion of the work shall remove such temporary piping and wiring.

C. The use of existing services shall be in such a manner and by such methods that will not interrupt the services to any of the Owner's facilities that are to remain in operation during construction.

1.02 BARRICADES AND SPECIAL CONTROLS:

A. Provide temporary barriers, fences, and warning signs around the sites of new buildings to control access of unauthorized persons to work areas, and as required by law. Special care shall be taken to provide adequate barriers and warning signs to prevent access of unauthorized persons to work areas where hazardous work is being performed.

B. Provide temporary barriers and warning signs at excavations that might be left open during nonworking hours, including warning lights at night.

1.03 CONSTRUCTION AIDS:

A. Provide necessary staging, scaffolding, and hoisting equipment and temporary walkways and ladders required for installation of the work under the Contract.

1.04 TEMPORARY BUILDINGS:

A. Provide temporary field office and storage sheds as required to carry on the work. Adequate space shall be provided in the field office for convenient use and storage of Contract Drawings and Specifications, approved shop drawings, samples, and field records. Truck trailers may be used for temporary field office and storage enclosures.

B. Upon completion of the work, all temporary buildings shall be removed and the area of the site that they occupied shall be restored to its condition at the commencement of work under the Contract.

1.05 SANITARY FACILITIES:

A. Provide adequate temporary toilet facilities for the use of workmen, conforming to applicable laws, ordinances, and governmental regulations.

B. Upon completion of the work, temporary toilet facilities shall be removed from the site.

C. Provide temporary sanitary facilities for use of the Building Occupants during the course of construction during time existing sanitary facilities have been removed from service and before new facilities are available for use of building occupants.

1. Provide separate portable toilets for men and women.

a. Service portable toilets weekly at a minimum during the time they are in service.

1.06 TEMPORARY ENCLOSURES:

A. Provide temporary weathertight closures for all exterior openings after walls and roof of the new building are constructed when it is necessary to protect the work from the weather and to permit the use of temporary heat. Provide weathertight and security protection of the existing building until what time as the new construction is able to provide weathertightness and security. Provide safety barriers as required to protect the occupants of the building.

B. Water Protection: Provide at all items for protection of excavation, trenches, and building from damage by rain water, spring water, ground water, backing up of drains or sewers, and all other water. Provide all pumps, equipment, temporary drains or dams, and enclosures necessary to provide this protection.

1.07 TEMPORARY HEAT AND VENTILATION:

A. Provide temporary heat and ventilation as necessary for protection and drying out of the work and to allow work to be prosecuted in cold weather.

B. Heat shall be provided by means of approved temporary heating equipment which in installation and operation will not damage the work. Provide adequate and proper fuels and all services required to furnish heat as required. Salamanders shall not be used inside the building. Heaters used to dry out or protect freshly placed concrete shall be of a type and shall be so ventilated as to prevent carbon dioxide from damaging concrete.

1. After the construction of the building has reached a point where the permanent heating and cooling systems are operable, the Contractor may use the permanent heating and cooling equipment for temporary heating and cooling. The heating and cooling systems shall not be used for temporary heat and cooling until the building is broom clean and shall not be used without all filters in place. Upon the completion of the work, all ducts and equipment shall be internally cleaned and all filters shall be replaced with new filters.

a. If permanent HVAC system for temporary use during construction is used, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00.

2. Contractor shall pay the hourly rate of the Engineer's and Testing and Balancing Agent's technical personnel to observe and document the condition of equipment and ductwork (30 minutes average per unit) used for construction term temporary heating and cooling. Engineers inspection of heat transfer coils must be complete prior to start-up, test and balance, and final acceptance. All warranties shall begin upon final acceptance by the Owner, not beneficial usage by the Contractor.

C. Costs of providing temporary heat shall be borne by the Contractor.

1.08 BULLETIN BOARD AND JOB SIGN:

A. On or near the field office, the Contractor shall install a bulletin board upon which to post legally required notices. The bulletin board shall be of adequate size to contain all required notices and be so constructed as to protect the postings from obliteration by the weather.

B. The Architect shall provide one painted sign stating the Architect (Michael Brady Inc.). Location of sign shall be as directed by the Architect. The Contractor shall erect a substantial wood frame to support the sign provided by the Architect.

C. Maintain all bulletin boards and job signs in good condition from start to completion of the work.

1.09 RODENT AND VERMIN CONTROL:

A. Provide on the project site ample and suitable refuse containers with covers. The Contractor shall be responsible for containing and removing from the site all refuse from meals eaten on the site and other rodent or vermin attracting refuse.

B. During the construction period precaution shall be taken as necessary to control the entry and breeding of rodents and vermin in the new building.

C. If, within three months after occupancy of the building, the building is found to be infested by rodents or vermin, the Contractor shall bear the cost of extermination.

1.10 REMOVAL OF CONSTRUCTION DEBRIS:

A. Provide suitable containers for and maintain regular a regular schedule for the removal of debris and rubbish from the construction site and surrounding area.

B. Pay all container rental fees, hauling, and landfill costs associated with the removal of debris and rubbish from the site.

1.11 PROTECTION:

A. Weather Protection: Provide at all times protection against rain, wind, storms, frost, or heat so as to maintain all work, materials, equipment and fixtures free from injury or damage. At end of days work, all new work likely to be damaged by weather conditions shall be covered.

B. Water Protection: Provide at all times protection of excavation, trenches, and building from damage by rain water, spring water, ground water, backing up of drains or sewers, and all other water. Provide all pumps, equipment, temporary drains or dams, and enclosures necessary to provide this protection.

C. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

D. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

E. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings, requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.

2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.

4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

1.12 TELEPHONE:

A. Install a single party telephone or a cellular phone and a facsimile machine or computer capable of sending and receiving email in the field office. The telephone shall be available for use by all persons concerned with the construction of the project and service shall be maintained from start to completion of the work. The cost of the telephone service shall be paid by the Contractor.

PART II PRODUCTS – NOT USED

PART III EXECUTION – NOT USED

End of Section

SECTION 01 60 00

PRODUCT REQUIREMENTS:

PART I GENERAL

1.01 STORAGE OF MATERIALS AND EQUIPMENT:

A. Storage of materials and equipment, location of field office, space for truck deliveries and parking of workmen's cars shall be restricted to areas of the site mutually agreed upon by the Contractor and the Owner prior to commencement of construction.

B. Storage of materials and equipment and truck deliveries shall not interfere with normal pedestrian and vehicular traffic.

C. Upon completion of the work, all damage to existing ground cover, paving, site improvements, or existing structures resulting from the storage of materials and equipment, construction vehicular traffic, or other construction operations under the Contract shall be repaired by the Contractor to its condition at commencement of work under the Contract.

1.02 PROTECTION OF MATERIALS AND EQUIPMENT:

A. Material and equipment stored on the site that are to be incorporated in the work shall be adequately protected from damage by the weather or by construction operations.

B. Materials subject to damage by water shall be blocked off the ground and protected with waterproof coverings, stored in weathertight floored sheds or in the building after it is enclosed.

C. Material that is subject to damage by soiling or by exposure shall be stored as to prevent physical damage to the materials and equipment.

D. Materials and equipment shall be so transported, handled, and stored as to prevent physical damage to the materials and equipment.

1.03 SUBSTITUTIONS:

A. All materials and equipment incorporated in the work shall be new and as specified, except such substitutions that are approved as provided by the provisions for substitutions set forth in the Supplementary Conditions.

B. Where substitutions are implemented, the Contractor shall be responsible for insuring that:

1. The proposed substitution does not affect dimensions shown on Drawings.

2. He will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.

3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.

4. Maintenance and service parts will be locally available for the proposed substitution.

PART II PRODUCTS – NOT USED

PART III EXECUTION – NOT USED

End of Section

SECTION 01 77 00

CONTRACT CLOSEOUT

PART I GENERAL

1.01 SECTION INCLUDES:

A. Closeout procedures.

B. Owner's Operating Instruction Session.

C. Adjusting.

D. Operation and Maintenance Data.

E. Project record documents.

F. Warranties

1.02 RELATED DOCUMENTS:

A. Applicable provisions of the General Conditions, Supplementary Conditions and Division 1, General Requirements, apply to the work under this section.

1.03 SUBSTANTIAL COMPLETION:

A. Notify the owner not less than twenty-one (21) days prior to the date of substantial completion to allow notification of tenants.

B. Submit written certification to Architect that Project, or designated portion of Project, is substantially complete. Include a list of items to be completed or corrected as a result of his inspection of the work.

C. Submit the Certificate of Occupancy issued by the local building authority to the Architect for forwarding to the Owner.

D. The Architect will make an inspection within seven (7) days after receipt of certification, together with Owner's Representative.

E. Should the Architect consider the work substantially complete:

1. The Contractor shall prepare, and submit to the Architect, a list of items to be completed or corrected, as determined by the Architect's inspection.
2. The Architect will prepare and issue a certificate of substantial completion, AIA document G704, complete with signatures of Owner, Contractor, and Architect, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect.
3. The Owner will occupy the project, under provisions stated in certificate of substantial completion.
4. The Contractor will complete work listed for completion or correction, within the designated time.
5. Refer to Supplementary Conditions Article 9.10.6 for failure to complete in a timely manner.

F. Should the Architect consider that the Work is not Substantially Complete:

1. He shall immediately notify Contractor, in writing stating reasons.

2. The Contractor shall complete the Work, and send second written notice to the Architect, certifying that the project or designated portion of project, is substantially complete.
3. The Architect will reinspect the work at the Contractor's expense.

1.04 OWNER'S OPERATING INSTRUCTION SESSION:

A. Conduct training session for Owner's designated personnel covering various mechanical, electrical, and other operating features for familiarization with the physical plant equipment and operation. One copy of the required (see various technical sections on project closeout) mechanical operations manual shall be on hand during this session along with the mechanics familiar with all equipment. These mechanics shall have on hand such tools and/or equipment to reveal controls and mechanic access areas. The instruction session shall be scheduled for a full day but in no case less than the minimum time required to review each type of equipment/operation. The minimum areas of instruction shall be:

1. Location and operation of project site water valves, meters and other operational equipment.
2. Location and operation of project electrical disconnects.
3. Operation of sewage handling facilities.
4. Sprinkler valves, alarms, test and operation.
5. Project landscape irrigation operation.
6. Project Site lighting operation/maintenance.
7. Storm sewer operation/configuration.
8. Refuse containment areas.
9. Roof maintenance/warrantee considerations. Traffic cautions.
10. HVAC unit operations/maintenance (filters and thermostats, boiler and/or cooling tower maintenance).
11. Interior lighting, lamp and ballast replacement.
12. Keying and lock operations.
13. Locations and use of required replacement finish materials such as floor and ceiling tiles and panels.
14. Notification procedures for Contractor warranty work.

B. Video Tape Owner's Instruction Session and provide two (2) copies on DVD to Owner as part of Close Out Documentation.

1.05 CLOSEOUT PROCEDURES AT FINAL COMPLETION:

A. As a precedent to final acceptance of the work and issuance of Certificate of Final Payment, including the Release of Retainage, certain submittals shall be made as specified in the various sections of the specifications. All such submittals shall be delivered to the Architect, in the form and number of copies specified, prior to or with the Contractor's request for final payment. Submittals shall include but not be limited to:

1. General Contractor's Affidavit, Waiver and Release of Lien Statements and Consent of Surety, to final payment as well as release of lien statements from all subcontractors and major material suppliers as specified in Subparagraph 9.10.2 of the General Conditions. These documents shall be addressed to the Owner, and shall be original signed documents and not reproduced copies. Two (2) sets of these drawings shall be submitted.
2. Written guarantees and warranties as specified in the various other sections of the specifications.
3. Record drawings as specified in the General Conditions and in Divisions 15 and 16.
4. One copy of each final approved shop drawing submitted during the course of the project.
5. Three copies of operation and maintenance data for mechanical equipment and electrical equipment.

6. Letter stating that to the best of the Contractor's knowledge, no asbestos containing materials or other Work hazardous materials or products as currently defined in the Resource Conservation and Recovery Act of 1976 (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), or Environmental Protection Agency (EPA) regulations, rules, or requirements, as amended
7. Contract Close-Out Submittals, except for record drawings, shall be submitted in commercial quality three ring binders with durable plastic covers. Identify the project on the face and side of the binders. Provide a cover sheet giving complete Project Title, Contractor's and Architect's name, address, phone number, name of project superintendent, and related general information. Include a Table of Contents to identify material in the Project Data Binders and a complete listing of subcontractors and material suppliers. Provide copies of all Certificates, Warranties and related documents as well as Product Data, Maintenance and Operation Data and related information required by the Contract Documents or furnished with items included in the Project. Two (2) sets of these documents shall be submitted.

B. Submit written certification that the Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for final inspection by Owner and Architect.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments and sum remaining due.

1.06 WARRANTIES:

A. Provide notarized copies.

B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in three D side ring binders with durable plastic covers. Note: This is in addition to copies of warranties provided with operation and maintenance binders.

D. Submit prior to final Application for Payment.

E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing date of acceptance as warranty period.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed, obtain receipt prior to final payment.

PART II PRODUCTS – NOT USED

PART III EXECUTION – NOT USED

End of Section

SECTION 01 77 10

CLEANING

PART I GENERAL

1.01 DESCRIPTION

A. Work Included: Throughout the construction period, maintain the roof buildings and site in a standard of cleanliness as described in this section.

B. Related Work Described Elsewhere: In addition to standards described in this section, comply with all requirements for cleaning up as described in various other sections of these specifications.

1.02 QUALITY ASSURANCE

A. Inspection: Conduct inspection daily, and more often if necessary, to verify that requirements for cleanliness are being met.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS AND EQUIPMENT

A. Provide all required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.02 COMPATIBILITY

A. Use only cleaning materials and equipment that are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the A/E.

PART 3 EXECUTION

3.01 PROGRESS CLEANING

A. General:

1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for the construction of this work.
3. At least once a day and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
4. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.

B. Site:

1. Daily and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Restock, tidy, or otherwise service all arrangements to meet the requirements of 3.01.A.l, above.
3. Maintain the site in a neat and orderly condition at all times. Use a magnet to remove small metal objects such as nails, fasteners, etc.

C. Structures:

1. The Contractor will be responsible for maintaining the existing level of cleanliness on any interior areas used by subcontractors or employees.

End of Section

SECTION 01 77 23

FINAL CLEANING

PART I GENERAL

1.01 GENERAL:

A. General cleaning of construction debris is required by the General Conditions and included in Section 01 77 10 Cleaning.

1.02 CLEANING:

A. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

B. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

C. Remove labels that are not permanent labels.

D. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

E. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces. Mop and polish resilient flooring.

F. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

G. Not more than 4 days before date scheduled for final inspection, clean flooring according to manufacturer's recommendations. Strip protective floor polish that was applied after completing installation only if required to restore polish finish and if recommended by flooring manufacturer. After cleaning, reapply polish to floor surfaces to restore protective floor finish and buff according to flooring manufacturer's written recommendations.

   1. Coordinate with Owner's custodial personnel and use Owner's selected materials for sealing and polishing floors.

H. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

1.03 REMOVAL OF PROTECTION:

A. Remove temporary protection and facilities installed for protection of the Work during construction.

1.04 COMPLIANCE:

A. Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

B. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

PART II PRODUCTS – NOT USED

PART III EXECUTION – NOT USED

End of Section

Contractor's Request for Information (RFI)

Project Name:	Contract No.:	Date:	RFI No.:
Contractor's Name:	To:		
Subject:			

References

Area(s):
Specification Section(s):
Drawing No.:
Other References:
Problem / Information Requested:

Information Requested by: Reply needed by:

Contractor's Interpretation and Proposed Resolution:

Architect's / Engineer's Evaluation and Response			
Disposition:	Clarification Only	Sketch or Drawing	Other
Approval:	Project Manager	Owner	Contractor

SECTION 03 05 16
UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 30 00 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.03 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Samples: Submit samples of underslab vapor barrier to be used.

D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
   2. Thickness: 15 mils.
   3. Basis of Design:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches.

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 04 20 00 - Unit Masonry: Reinforcement for masonry.

D. Section 04 20 01 - Masonry Veneer: Spacing for veneer anchor reglets recessed in concrete.

E. Section 05 12 00 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

F. Section 05 21 00 - Steel Joist Framing: Placement of embedded steel anchors, plates and joist seats in cast-in-place concrete.

1.03 REFERENCE STANDARDS

A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).

D. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).

E. ASME A17.1 - Safety Code for Elevators and Escalators; 2016.

F. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Permanent Insulated Foam Panel Formwork Shop Drawings: Include calculations or selections from manufacturer's prescriptive design tables that indicate compliance with applicable building code and manufacturer's requirements.
   1. Include test reports for performance criteria specified.
   2. Include the design engineer's stamp or seal on each sheet of shop drawings.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Chamfer outside corners of beams, joists, columns, and walls.

D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

E. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

F. Use the following form types:

1. Basement Walls Not Exposed To View: Site fabricated plywood.
2. Basement Walls Exposed To View: Site fabricated rough sawn lumber.
3. Elevated Floor Slabs: Prefabricated glass fiber pan forms, treated for exposed to view finish.
4. Elevated Floor/Roof Slabs: Permanent prefabricated foam panel formwork; formwork to remain.

2.02 WOOD FORM MATERIALS

A. Softwood Plywood: PS 1, C Grade, Group 2.

B. Lumber: per drawings species; per drawings grade; with grade stamp clearly visible.

2.03 REMOVABLE PREFABRICATED FORMS

A. Pan Type: Glass fiber, of size and profile indicated.

B. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; 2 inches thick. Provide _____ manufactured by _____.

2.04 PERMANENT PREFABRICATED FOAM PANEL FORMWORK

A. Floor/Roof Deck Forms: Pre-engineered expanded polystyrene foam plastic deck and beam/joist forms with factory installed metal channel furring strips flush with face of panel and field installed form stiffener slots.
   1. Structural Performance: In accordance with applicable code.
   2. Form Cross Section: As indicated on drawings; flat-bottomed solid foam blocks with voids only for stiffeners and beam/joist cross-section; interlocking long edges.

2.05 FORMWORK ACCESSORIES

A. Form Ties: Removable type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.

B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
   1. Composition: Colorless reactive or mineral oil-based compound.
   2. Do not use materials containing diesel oil or petroleum-based compounds.
   3. VOC Content: In compliance with applicable local, State, and federal regulations.
   4. Products:
      a. SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com/#sle.
      b. W. R. Meadows, Inc; Duogard: www.wrmeadows.com/#sle.

C. Filler Strips for Chamfered Corners: Wood strip type; 3/4 inch size; maximum possible lengths.

D. Dovetail Anchor Slot: Galvanized steel, at least 22 gage, 0.0299 inch thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

E. Flashing Reglets: Galvanized steel, at least 22 gage, 0.0299 inch thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork. Provide _____ manufactured by _____.

F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

G. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 12 00.

H. Waterstops: Rubber, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, 1 inch wide, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth forms are only permitted at footings.

B. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members that are not indicated on drawings.

F. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

G. Coordinate this section with other sections of work that require attachment of components to formwork.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Position recessed anchor slots for brick veneer masonry anchors to spacing and intervals specified in Section 04 20 01.

E. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

F. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.

G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

H. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.
   1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
   2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

B. Construct permanent insulated foam panel formwork to maintain tolerances required by ACI 301.

C. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.

3.08 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 15 21
TERMITE BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Termite-resistant vapor barrier sheet.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Vapor barrier placement under concrete slab-on-grade.

1.03 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.

C. Test Reports: Submit manufacturer's summary of independent laboratory and field testing for effectiveness in subterranean termite exclusion.

D. Manufacturer's Installation Instructions.

E. Warranty: Submit warranty and ensure that forms have been completed in KCDC's name.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 TERMITE BARRIER SHEET

A. Termite-Resistant Vapor Barrier Sheet: Plastic sheet complying with ASTM E1745, Class C; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs, and for exclusion of subterranean termites.

B. Accessory Products: Barrier sheet manufacturer's recommended tape, adhesive, etc., for sealing seams and penetrations in termite barrier.

C. Manufacturer: Stego Technology LLC; Pango Wrap with Pango Tape: www.stegoindustries.com/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen.

B. Verify final grading is complete.

3.02 INSTALLATION - BARRIER SHEET

A. Comply with ASTM E1643.

B. Lap joints 6 inches, minimum. Seal joints, seams, penetrations, and edges at adjacent materials with manufacturer's recommended products and follow manufacturer's written instructions.

3.03 PROTECTION

A. Protect sheet materials from damage after completed installation.

B. Repair damage to installed sheet materials with manufacturer's recommended products and according to the manufacturer's written instructions.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 03 45 00 - Precast Architectural Concrete: Reinforcement for precast concrete panels.

D. Section 04 20 00 - Unit Masonry: Reinforcement for masonry.

E. Section 04 20 01 - Masonry Veneer: Spacing for veneer anchor reglets recessed in concrete.

F. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Grounding connection to concrete reinforcement.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2016.

B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).

C. ACI SP-66 - ACI Detailing Manual; 2004.

D. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2019.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.

F. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.

G. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement; 2019.

H. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.

I. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.

J. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement; 2016.

K. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

L. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2018.

M. CRSI (DA4) - Manual of Standard Practice; 2009.

N. CRSI (P1) - Placing Reinforcing Bars; 2011.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SP-66 and ACI 318.
   1. Maintain one copy of each document on project site.

B. Provide Architect / or Special Inspector with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

C. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Deformed billet-steel bars.
   2. Unfinished.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
   1. Form: Coiled Rolls.
   2. WWR Style: As indicated on drawings.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.
   1. Products:
      a. Dayton Superior Corporation; Bar Luck Coupler System: www.daytonsuperior.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.
   1. Products:
      a. Dayton Superior Corporation; _____: www.daytonsuperior.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Grout: Cementitious, non-metallic, non-shrink grout for use with manufacturer's grout sleeve reinforcing bar coupler system.
   1. Products:
      a. Dayton Superior Corporation; _____: www.daytonsuperior.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is not permitted.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcing per ACI 318:
   1. Beams:per drawings inch
   2. Supported Slabs and Joists: per drawings inch.
   3. Column Ties: per drawings inch.
   4. Walls (exposed to weather or backfill): per drawings inch.
   5. Footings and Concrete Formed Against Earth: per drawings inch.
   6. Slabs on Fill: per drawings inch.

3.02 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 40 00 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete building frame members.

B. Concrete for composite floor construction.

C. Elevated concrete slabs.

D. Floors and slabs on grade.

E. Concrete shear walls, elevator shaft walls, and foundation walls.

F. Concrete reinforcement.

G. Joint devices associated with concrete work.

H. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, and flagpole bases.

I. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

D. Section 32 13 13 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

C. ACI 301 - Specifications for Structural Concrete; 2016.

D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

F. ACI 305R - Guide to Hot Weather Concreting; 2010.

G. ACI 306R - Guide to Cold Weather Concreting; 2016.

H. ACI 308R - Guide to External Curing of Concrete; 2016.

I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).

J. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).

K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.

L. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

M. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.

N. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

O. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2018.

P. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.

Q. ASTM C476 - Standard Specification for Grout for Masonry; 2018.

R. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2019a.

S. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

T. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.

U. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

V. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.

W. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.

X. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

Y. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

Z. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.

AA. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

AB. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes; 2018.

AC. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.

AD. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2017.

AE. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2017.

AF. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2015.

AG. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2019.

AH. ASTM C1582/C1582M - Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete; 2011, with Editorial Revision (2017).

AI. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type); 2011 (Reapproved 2016).

AJ. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.

AK. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars; 2015.

AL. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a, with Editorial Revision (2013).

AM. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 2014.

AN. ASTM E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers (Metric); 2014.

AO. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

AP. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

AQ. ASTM E1993/E1993M - Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 1998, with Editorial Revision (2013).

AR. COE CRD-C 513 - COE Specifications for Rubber Waterstops; 1974.

AS. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.

AT. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems; 2014, with Editorial Revision (2017).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

C. Samples: Submit samples of underslab vapor retarder to be used.

D. Test Reports: Submit report for each test or series of tests specified.

E. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in KCDC's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
   1. Maintain one copy of each document on site.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. For slabs required to include moisture vapor reduction admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Slabs with Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover the cost of flooring failures due to moisture migration from slabs for life of the concrete.
   1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.
   2. Provide warranty by manufacturer of MVRA matching terms of flooring adhesive or primer manufacturer's material defect warranty.

C. Moisture Emission Reducing Curing and Sealing Compound: Provide warranty to cost of flooring delamination failures for 10 years.
   1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

D. Termite-Resistant Vapor Barrier Sheet: Provide five year manufacturer's limited warranty.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 03 10 00.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03 20 00.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class C or F.

D. Calcined Pozzolan: ASTM C618, Class N.

E. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. Moisture Vapor Reduction Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to close capillary systems formed during curing to reduce moisture vapor emission and transmission with no adverse effect on concrete properties or finish flooring.
   1. Provide admixture in slabs to receive adhesively applied flooring.
   2. Manufacturers:
      a. Barrier One, Inc; Barrier One Moisture Vapor Reduction Admixture: www.barrierone.com/#sle.
      b. Hycrete, Inc; _____: www.hycrete.com/#sle.
      c. ISE Logik Industries, Inc; MVRA 900: www.iselogik.com/#sle.
      d. Specialty Products Group; Vapor Lock 20/20: www.spggogreen.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 BONDING AND JOINTING PRODUCTS

A. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

B. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.

C. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.

D. Dowel Sleeves: Plastic sleeve for smooth, round, steel load-transfer dowels.

E. Plate Dowel System: Steel plate dowel and plastic dowel sleeve; with integral fasteners for attachment to formwork.

2.06 CURING MATERIALS

A. Curing and Sealing Compound, Moisture Emission Reducing, Membrane-Forming: Liquid, membrane-forming, clear sealer, for application to newly-placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.
   1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.

2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
3. VOC Content: Less than 100 g/L.
4. Solids Content: 25 percent, minimum.
5. Manufacturers:
   a. Floor Seal Technology, Inc; VaporSeal 309 System: www.floorseal.com/#sle.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
   4. Water-Cement Ratio: Maximum 40 percent by weight.
   5. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
   6. Maximum Slump: 4 inches.
   7. Maximum Aggregate Size: 3/4 inch.

2.08 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Verify that forms are clean and free of rust before applying release agent.

B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

C. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
   1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

B. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

D. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.

E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

F. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
   3. Under Carpeting: 1/4 inch in 10 feet.

B. Correct the slab surface if tolerances are less than specified.

C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   2. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

B. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.08 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   3. Final Curing: Begin after initial curing but before surface is dry.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

D. Slab Testing: Cooperate with manufacturer of specified moisture vapor reduction admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

3.10 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.11 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

CONCRETE MIX DESIGN SUBMITTAL FORM

Project: _____
City: _____
General Contractor: _____
Concrete Contractor: _____
Concrete Strength (Class): _____
Use (describe): _____

Design Mix Information

	Please check one
Based on Standard Deviation Analysis	
Trial Mix Test Data	

Design Characteristics:

Density		pcf
Strength		psi (28 day)
Air		% specified

If trial mixes are used the Mix Design is proportioned to achieve f'cr = f'c + 1200 psi
(1400 psi for strength higher than 5000 psi at 28 days)

MATERIALS	***Type/ Source***	***Specific Gravity***	***Weight/lb.***	***Absolute Vol. cu.ft.***
Cement				
Flyash				
Microsilica				
Coarse Aggregate				
Fine Aggregate				
Water				
Air				
Other				
		TOTAL		27.0 cu. ft.

* Water/Cement Ratio (lbs. water/lbs. cement) = _____%

ADMIXTURES	**Manufacturer**	**Dosage oz/cwt**
Water Reducer		
Air Entraining Agent		
High Range Water Reducer		
Non-Corrosive Accelerator		
Other		

Slump before HRWR _____ *inches*
Slump after HRWR _____ *inches*

Standard Deviation Analysis (from experience records):

# of Test Cylinders Evaluated:	
Standard Deviation:	

f'cr-f'c + 1.34s or f'cr = f'c + 2.33s - 500

(Refer to ACI 301 for increased deviation factor when less than 30 tests are available)

LABORATORY TEST DATA

Compressive Strength

Age (days)	Mix # 1	Mix #2	Mix #3
7	psi	psi	psi
7	psi	psi	psi
28	psi	psi	psi
28	psi	psi	psi
28 average	psi	psi	psi

REQUIRED ATTACHMENTS:

	Please Check
Coarse Aggregate Gradation Report	
Fine Aggregate Gradation Report	
Concrete Compressive Strength Data or Trial Mixture Test Data	
Admixture Compatibility certification letter	

Submitted by:

Name: _____
Address: _____
_____
Phone #: _____
Main Plant Location: _____
Miles from Project: _____
Secondary Plant Location: _____
Miles from Project: _____
Date: _____

SECTION 04 05 11

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Installation of mortar and grout.

B. Section 04 20 01 - Masonry Veneer: Installation of mortar.

C. Section 08 11 13 - Hollow Metal Doors and Frames: Products and execution for grouting steel door frames installed in masonry.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

B. ASTM C5 - Standard Specification for Quicklime for Structural Purposes; 2018.

C. ASTM C91/C91M - Standard Specification for Masonry Cement; 2018.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2019a.

E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

F. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019.

I. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar; 2017.

J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2018.

L. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2018a.

M. ASTM C1019 - Standard Test Method for Sampling and Testing Grout; 2018.

N. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength; 2013, with Editorial Revision (2014).

O. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2018.

P. ASTM E518/E518M - Standard Test Methods for Flexural Bond Strength of Masonry; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

C. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.

D. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.07 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Mortar Color: Natural gray unless otherwise indicated.

C. Mortar Mix Designs: ASTM C270, Property Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior Masonry Veneer: Type N.
   3. Exterior Cavity Walls: Type S mortar with Type N pointing mortar.
   4. Engineered Masonry: Type M.
   5. Exterior, Loadbearing Masonry: Type N.
   6. Exterior, Non-loadbearing Masonry: Type N.
   7. Interior, Loadbearing Masonry: Type N.
   8. Interior, Non-loadbearing Masonry: Type N.
   9. Pointing Mortar for Prefaced or Specially Faced Unit Masonry: One part Portland cement, 1/8 part hydrated lime, and two parts graded (80 mesh) aggregate, proportioned by volume. Add aluminum tristearate, calcium stearate, or ammonium stearate equal to 2 percent of Portland cement by weight.

D. Grout Mix Designs:
   1. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
      a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
      b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
   2. Engineered Masonry: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
      a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.

2.02 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C387/C387M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Type N.
   2. Color: As indicated on architectural drawings.

B. Packaged Dry Material for Mortar for Repointing: Premixed Portland cement, graded sand, and chemical admixtures complying with ASTM C91/C91M with the addition of water only.
   1. Color: As indicated on architectural drawings.

C. Packaged Dry Material for Mortar for Repointing: Premixed Portland cement, hydrated lime, and graded sand; capable of producing Type O mortar in accordance with ASTM C270 with the addition of water only.
   1. Color: As indicated on architectural drawings.

D. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
   1. Type: Fine.

E. Portland Cement: ASTM C150/C150M.
   1. Type: Type I - Normal; ASTM C150/C150M.
   2. Color: As indicated on architectural drawings.

F. Masonry Cement: ASTM C91/C91M.
   1. Type: Type N; ASTM C91/C91M.
   2. Colored Mortar: Premixed cement as required to match Architect's color sample.

G. Hydrated Lime: ASTM C207, Type S.

H. Quicklime: ASTM C5, non-hydraulic type.

I. Mortar Aggregate: ASTM C144.

J. Grout Aggregate: ASTM C404.

K. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): As indicated on drawings.

L. Water: Clean and potable.

M. Bonding Agent: Latex type.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.

D. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

E. Do not use anti-freeze compounds to lower the freezing point of mortar.

F. If water is lost by evaporation, re-temper only within two hours of mixing.

2.04 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

3.03 GROUTING

A. Use either high-lift or low-lift grouting techniques, at Contractor's option, subject to other limitations of Contract Documents.

B. Low-Lift Grouting:
   1. Limit height of pours to 12 inches.

2. Limit height of masonry to 16 inches above each pour.
3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

C. High-Lift Grouting:
1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
2. Brick: Limit pours to maximum 12 feet in height and 25 feet horizontally.
3. Hollow Masonry: Limit lifts to maximum 4 feet and pours to maximum height of 24 feet.
4. Place grout for spanning elements in single, continuous pour.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field tests, in accordance with provisions of Section 01 40 00 - Quality Requirements.

B. Test and evaluate mortar in accordance with ASTM C780 procedures.
1. Test with same frequency as specified for masonry units.

C. Test and evaluate grout in accordance with ASTM C1019 procedures.
1. Test with same frequency as specified for masonry units.

D. Prism Tests: Test masonry and mortar panels for compressive strength in accordance with ASTM C1314, and for flexural bond strength in accordance with ASTM C1072 or ASTM E518/E518M; perform tests and evaluate results as specified in individual masonry sections.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Concrete facing brick.

C. Clay facing brick.

D. Common brick.

E. Hollow brick.

F. Reinforcement and anchorage.

G. Flashings.

H. Lintels.

I. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing: Reinforcing steel for grouted masonry.

B. Section 03 30 00 - Cast-in-Place Concrete: Installation of dovetail slots for masonry anchors.

C. Section 04 05 11 - Mortar and Masonry Grout.

D. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

E. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.

F. Section 07 11 13 - Bituminous Dampproofing: Dampproofing parged masonry surfaces.

G. Section 07 21 00 - Thermal Insulation: Insulation for cavity spaces.

H. Section 07 62 00 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.

I. Section 07 84 00 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

J. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.

B. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016.

C. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

D. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2017.

E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.

F. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.

G. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2018a.

H. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

I. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.

J. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019.

K. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale); 2019a.

L. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2018a.

M. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

N. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

O. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

E. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

F. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
   1. Maintain one copy of each document on project site.

B. Fire Rated Assemblies: Comply with applicable code for UL (FRD) Assembly No. as listed in Construction Documents.

1.07 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.

B. Locate Per Architect's request and on a south facing wall with direct sunlight..

C. Mock-up may remain as part of the Work.

D. Mock-up to show the material transitions between all veneer types

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
   2. Special Shapes: Provide non-standard blocks configured for corners.
   3. Load-Bearing Units: ASTM C90, normal weight.
      a. Hollow block, as indicated.

b. Exposed Faces: Special color and texture where indicated, as follows: _____.

4. Non-Loadbearing Units: ASTM C129.
   a. Hollow block, as indicated.

2.02 BRICK UNITS

A. Manufacturers:
   1. As indicated on Construction Documents.

B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
   1. Color and texture to match Architect's sample.
   2. Nominal size: As indicated on drawings.
   3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

C. Building (Common) Brick: ASTM C62, Grade SW; solid units.
   1. Nominal size: As indicated on drawings.

D. Hollow Facing and Building Brick: ASTM C652, Grade SW; Type HBS; Class H40V.
   1. Color and texture to match Architect's sample.
   2. Nominal size: As indicated on drawings.

2.03 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 05 11.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Blok-Lok Limited; _____: www.blok-lok.com/#sle.
   2. Hohmann & Barnard, Inc; X-Seal Anchor: www.h-b.com/#sle.
   3. WIRE-BOND; _____www.wirebond.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reinforcing Steel: Type specified in Section 03 20 00; size as indicated on drawings; galvanized finish.

C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss or ladder.
   2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3.
   3. Size: 0.1875 inch side rods with 0.1875 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss, with adjustable ties or tabs spaced at 16 in on center.
   2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B.
   3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inchwire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
   4. Vertical adjustment: Not more than 2 inches.
   5. Seismic Feature: Provide lip, hook, or clip on extended leg of wall ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
   6. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

F. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 1-1/2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M, Class B.

G. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.

H. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
   2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
   3. Vertical adjustment: Not less than 3-1/2 inches.
   4. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.

2.05 FLASHINGS

A. Metal Flashing Materials: Copper, as specified in Section 07 62 00.

B. Termination Bars: Stainless steel; compatible with membrane and adhesives.
   1. Manufacturers:
      a. York Manufacturing, Inc; Termination Bar: www.yorkmfg.com/#sle.
      b. Mortar Net Solutions; Termination Bars: www.mortarnet.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
   1. Manufacturers:
      a. Mortar Net Solutions; Metal Drip Edges: www.mortarnet.com/#sle.

D. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.06 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      a. Blok-Lok Limited; _____: www.blok-lok.com/#sle.
      b. Hohmann & Barnard, Inc; _____: www.h-b.com/#sle.
      c. WIRE-BOND; _____: www.wirebond.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
   1. Manufacturers:
      a. Hohmann & Barnard, Inc; _____: www.h-b.com/#sle.
      b. WIRE-BOND; _____: www.wirebond.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
   1. Full-Height Airspace Maintenance and Drainage Material: Mesh panels, fitted between masonry ties.
      a. Manufacturers:
         1) Advanced Building Products, Inc; Mortairvent-CW: www.advancedbuildingproducts.com/#sle.

2) CavClear/Archovations, Inc; CavClear Masonry Mat: www.cavclear.com/#sle.
3) CavClear/Archovations, Inc; CavClear Polyisocyanurate Insulation System: www.cavclear.com/#sle.
4) Substitutions: See Section 01 60 00 - Product Requirements.

D. Nailing Strips: Softwood lumber, preservative treated; as specified in Section 06 10 00.

E. Weeps:
1. Type: Molded PVC grilles, insect resistant.
2. Color(s): to blend with brick and mortar.
3. Manufacturers:
a. Advanced Building Products, Inc; _____: www.advancedbuildingproducts.com/#sle.
b. Blok-Lok Limited; _____: www.blok-lok.com/#sle.
c. Hohmann & Barnard, Inc; _____: www.h-b.com/#sle.
d. Mortar Net Solutions; WeepVent: www.mortarnet.com/#sle.
e. WIRE-BOND; _____: www.wirebond.com/#sle.
f. Substitutions: See Section 01 60 00 - Product Requirements.

F. Cavity Vents:
1. Type: Molded PVC grilles, insect resistant.
2. Manufacturers:
a. Advanced Building Products, Inc; _____: www.advancedbuildingproducts.com/#sle.
b. Blok-Lok Limited; _____: www.blok-lok.com/#sle.
c. CavClear/Archovations, Inc: www.cavclear.com/#sle.
d. Hohmann & Barnard, Inc; _____: www.h-b.com/#sle.
e. Mortar Net Solutions; CellVent: www.mortarnet.com/#sle.
f. WIRE-BOND; _____: www.wirebond.com/#sle.
g. Substitutions: See Section 01 60 00 - Product Requirements.

G. Multicomponent Cavity Wall Drainage System: Combination mortar diverter, flashing and weep system.
1. Membrane Type: Stainless steel.
2. Drip Edge: Stainless steel.
3. Termination Bar: Stainless steel.
4. System Unit Length: 5 feet, 6 inches.
5. Manufacturers:
a. Mortar Net Solutions; TotalFlash Panel: www.mortarnet.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

H. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 LINTELS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

D. Brick Units:
   1. Bond: Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches.
   3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners, except for units laid in stack bond.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 24 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforce joint corners and intersections with strap anchors 16 inches on center.

F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

C. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.10 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY

A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties spaced as indicated on drawings.

B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

3.11 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

C. Extend laminated flashings to within 1/4 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

3.12 LINTELS

A. Install loose steel lintels over openings.

B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
   1. Do not splice reinforcing bars.
   2. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
   3. Place and consolidate grout fill without displacing reinforcing.
   4. Allow masonry lintels to attain specified strength before removing temporary supports.

C. Maintain minimum 16 inch bearing on each side of opening.

D. Install thermal brick support system in accordance with manufacturer's instructions at locations indicated on drawings

3.13 GROUTED COMPONENTS

A. Reinforce bond beams with 2, No. 5 bars, 1 inch from bottom web.

B. Lap splices minimum 32 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At bearing locations, fill masonry cores with grout for a minimum 16 inches either side of opening.

3.14 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

D. Form expansion joint as detailed on drawings.

3.15 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation from Alignment of Columns: 1/4 inch.

C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

G. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.16 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.17 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.18 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

3.19 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members.

B. Structural steel support members, sag rods, and struts.

C. Base plates, shear stud connectors and expansion joint plates.

D. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 05 21 00 - Steel Joist Framing.

B. Section 05 31 00 - Steel Decking: Support framing for small openings in deck.

C. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

D. Section 07 81 00 - Applied Fireproofing: Fireproof protection to framing and metal deck systems.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2017.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.

E. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2018.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).

H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.

I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

J. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2018.

K. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2015.

L. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2007 (Reapproved 2013).

M. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).

N. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

O. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2017.

P. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film; 2017.

Q. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2019.

R. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2012.

S. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2015.

T. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2018.

U. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2018a.

V. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series; 2017a.

W. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

X. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

Y. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2018.

Z. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2014, with Errata (2015).

AA. SSPC-SP 3 - Power Tool Cleaning; 2018.

AB. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Maintain one copy of each document on site.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.

E. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Tennessee. Provide stamped designs and calculations for connections not specifically detailed.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with UL (FRD) Assembly Design No. as listed in the Construction Documents.

2.02 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.

E. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.

F. Steel Plate: ASTM A514/A514M.

G. Steel Sheet: ASTM A1011/A1011M, Designation SS, Grade 30 hot-rolled, or ASTM A1008/A1008M, Designation SS, Grade 30 cold-rolled.

H. Pipe: ASTM A53/A53M, Grade B, Finish black.

I. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

J. Sag Rods: ASTM A36/A36M.

K. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M, Class C.

L. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.

M. Tension Control Bolts: Twist-off type; ASTM F3125/F3125M.

N. Headed Anchor Rods: ASTM A307, Grade C, plain.

O. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.

P. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

Q. Sliding Bearing Plates: Teflon coated.

R. Grout: Non-shrink, non-metallic type, complying with 1 and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

S. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

T. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Space shear stud connectors at as indicated on drawings inches on center.

C. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

D. Fabricate connections for bolt, nut, and washer connectors.

E. Develop required camber for members.

2.04 FINISH

A. Prepare structural component surfaces in accordance with SSPC-SP 3.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

2.05 SOURCE QUALITY CONTROL

A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 50 percent of bolts at each connection.

B. Welded Connections: Visually inspect all shop-welded connections and test at least 30 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94/E94M.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Architect.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 50 percent of bolts at each connection.

C. Welded Connections: Visually inspect all field-welded connections and test at least 30 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94/E94M.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION

SECTION 05 31 00

STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Composite floor deck.

B. Supplementary framing for openings up to and including 18 inches.

C. Bearing plates and angles.

D. Stud shear connectors.

1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing.

B. Section 03 30 00 - Cast-in-Place Concrete: Concrete topping over metal deck.

C. Section 04 20 00 - Unit Masonry: Placement of anchors for bearing plates embedded in unit masonry assemblies.

D. Section 04 29 00 - Engineered Unit Masonry: Placement of anchors for bearing plates embedded in reinforced unit masonry.

E. Section 05 12 00 - Structural Steel Framing: Support framing for openings larger than 18 inches and shear stud connectors.

F. Section 05 12 00 - Structural Steel Framing: Placement of embedded steel anchors for bearing plates in cast-in-place concrete.

G. Section 07 81 00 - Applied Fireproofing: Spray applied fireproofing.

H. Section 26 05 33.16 - Boxes for Electrical Systems: Electrical, telephone, and _____ floor outlets, sleeves, and gaskets.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2018.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2018.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

G. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

I. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

J. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2018.

K. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems; 2016.

L. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; 2016.

M. ITS (DIR) - Directory of Listed Products; current edition.

N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.

P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

Q. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

R. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.

D. Certificates: Certify that products furnished meet or exceed specified requirements.

E. Submit manufacturer's installation instructions.

F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

B. Installer Qualifications: Company specializing in performing the work of this Section with minimum 10 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Deck:
   1. Canam Steel Corporation; ____: www.canam-steeljoists.ws.
   2. Cordeck, Inc; _____: www.cordeck.com/#sle.
   3. Nucor-Vulcraft Group; ____: www.vulcraft.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 STEEL DECK

A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
   1. Calculate to structural working stress design and structural properties specified.
   2. Maximum Vertical Deflection of Floor Deck: 1/360 of span.
   3. Maximum Lateral Deflection of Diaphragms: 1/500 of the height of the wall.

B. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.

2.03 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steel, galvanized per ASTM A123/A123M.

B. Stud Shear Connectors: Made from ASTM A108 Grade 1015 bars.

C. Welding Materials: AWS D1.1/D1.1M.

D. Fasteners: Galvanized hardened steel, self tapping.

E. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.
   1. Design Requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications.
   2. Material: Steel; ASTM A510/A510M.
      a. Hardness: Rockwell C 54.5, minimum.
      b. Tensile Strength: 285 kips per square inch, minimum.
      c. Shear Strength: 175 kips per square inch, minimum.
      d. Washers:
         1) Steel Bar Joist Framing Applications: 0.472 inch diameter, minimum.
         2) Exposed Roof Deck Applications: 0.591 inch diameter, minimum.
      e. Corrosion Resistance:
         1) Steel Bar Joist Framing Applications: ASTM B633, SC1, Type III zinc electroplate..
         2) Exposed Roof Deck Applications: Provide manufacturer's standard stainless steel sealing caps with bonded neoprene washer over each fastener.

F. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
   1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM)SDI design method for roof deck and floor deck applications.

G. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

J. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.04 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gage, 0.0299 inch thick sheet steel; of profile and size as indicated; finished same as deck.

B. Cant Strips: Formed sheet steel, 14 gage, 0747 inch minimum thickness, 45 degree slope, 3-1/2 inch nominal width and height, flange for attachment.

C. Floor Drain Pans: Formed sheet steel, 14 gage, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below floor deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. On concrete and masonry surfaces provide minimum 4 inch bearing.

C. On steel supports provide minimum 1-1/2 inch bearing.

D. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at each transverse flute using methods specified.
   1. Welding: Use fusion welds through weld washers.
   2. Place and secure special deep fluted sections for integral concrete bridging.

E. At mechanically fastened male/female side laps fasten at 24 inches on center maximum.

F. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

G. At welded male/female side laps weld at 18 inches on center maximum.

H. Weld deck in accordance with AWS D1.3/D1.3M.

I. At deck openings from 6 inches to 18 inches in size, provide 2 by 2 by 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.

J. At deck openings greater than 18 inches in size, provide steel angle reinforcement. as specified in Section 05 12 00.

K. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.

L. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.

M. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

N. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.

O. Place metal cant strips in position and fusion weld.

P. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

Q. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

R. Weld stud shear connectors through steel deck to structural members below.

S. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.

B. Exterior wall sheathing.

C. Formed steel purlin framing and bridging.

D. Water-resistive barrier over sheathing.

1.02 RELATED REQUIREMENTS

A. Section 04 20 01 - Masonry Veneer: Veneer masonry supported by wall stud metal framing.

B. Section 05 31 00 - Steel Decking.

C. Section 06 10 00 - Rough Carpentry: Wood blocking and miscellaneous framing.

D. Section 06 10 00 - Rough Carpentry: Roof and wall sheathing.

E. Section 07 21 00 - Thermal Insulation: Insulation within framing members.

F. Section 07 62 00 - Sheet Metal Flashing and Trim: Head and sill flashings.

G. Section 07 92 00 - Joint Sealants.

H. Section 09 21 16 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.

I. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

J. Section 09 22 16 - Non-Structural Metal Framing.

K. Section 09 51 00 - Acoustical Ceilings: Ceiling suspension system.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2012.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members; 2018.

D. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2011a (Reapproved 2015).

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
   1. Indicate stud and ceiling joist layout.
   2. Describe method for securing studs to tracks and for bolted framing connections.
   3. Design data:
      a. Shop drawings signed and sealed by a professional structural engineer.
   4. Calculations for loadings and stresses of specially fabricated framing, signed and sealed by a professional structural engineer.
   5. Details and calculations for factory-made framing connectors, signed and sealed by a professional structural engineer.

E. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Tennessee.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:
   1. CEMCO; _____: www.cemcosteel.com/#sle.
   2. Marino; ____: www.marinoware.com/#sle.
   3. The Steel Network, Inc; _____: www.SteelNetwork.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.
   2. Simpson Strong Tie; ____: www.strongtie.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Design Loads: In accordance with applicable codes.
   4. Live load deflection meeting the following, unless otherwise indicated:
      a. Exterior Walls: Maximum horizontal deflection under wind load of L/600 when backing masonry and/or as indicated on drawings of span.
      b. Design non-axial loadbearing framing to accommodate not less than 1/2 in vertical deflection.
   5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

C. Shop fabricate framing system to the greatest extent possible.

D. Deliver to site in largest practical sections.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
   1. Gage and Depth: As required to meet specified performance levels.
   2. Galvanized in accordance with ASTM A653/A653M, G90/Z275 coating.
   3. Provide components fabricated from ASTM A1008/A1008M, Designation SS (structural steel).

B. Framing Connectors: Factory-made, formed steel sheet.
   1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gage, 0.1345 inch, and factory punched holes and slots.
   2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
   3. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
      a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
      b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
      c. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 10 feet.
   4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.
   5. Wall Stud Bridging Connections: Provide mechanical load-transferring devices that accommodate wind load torsion and weak axis buckling induced by axial compression loads. Provide bridging connections 48" o.c. max.

2.04 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
   1. Products:
      a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series; _____: www.ITWBuildex.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Anchorage Devices: Powder actuated.

C. Welding: Comply with AWS D1.1/D1.1M.

2.05 WALL SHEATHING

A. Gypsum Board Wall Sheathing: See Section 09 21 16.

B. Board Insulation Wall Sheathing: See Section 07 21 00.

2.06 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

D. Water-Resistive Barrier: As specified in Section 07 25 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 12 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using clip and tie method.

D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

H. Install intermediate studs above and below openings to align with wall stud spacing.

I. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

J. Attach cross studs to studs for attachment of fixtures anchored to walls.

K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

3.03 INSTALLATION OF JOISTS AND PURLINS

A. Install framing components in accordance with manufacturer's instructions.

B. Make provisions for erection stresses. Provide temporary alignment and bracing.

3.04 INSTALLATION OF WALL SHEATHING

A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
   1. Provide steel diagonal bracing at corners with foam insulation or gypsum board wall sheathing.
   2. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

B. Downspout boots.

C. Prefabricated ladders and ship ladders

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 04 20 01 - Masonry Veneer: Placement of metal fabrications in masonry.

D. Section 04 29 00 - Engineered Unit Masonry: Placement of metal fabrications in masonry.

E. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.

F. Section 05 31 00 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.

G. Section 05 51 00 - Metal Stairs.

H. Section 05 51 33 - Metal Ladders.

I. Section 05 52 13 - Pipe and Tube Railings.

J. Section 07 71 23 - Manufactured Gutters and Downspouts: Downspout boots.

K. Section 09 91 13 - Exterior Painting: Paint finish.

L. Section 09 91 23 - Interior Painting: Paint finish.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.04 QUALITY ASSURANCE

A. Design ladders and other load supporting items under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Tennessee.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M or A992

B. Steel Tubing: ASTM A500/A500M, Grade C cold-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

F. Slotted Channel Fittings: ASTM A1011/A1011M.

G. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

H. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

J. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

K. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

C. Lintels: As detailed; galvanized finish.

D. Door Frames for Overhead Door Openings, Wall Openings, and _____: Channel sections; prime paint finish.

E. Recessed Mat Frames : As detailed; steel, galvanized finish.

F. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.

G. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; factory-applied, rust-inhibiting thermoset acrylic enamel finish.

2.05 DOWNSPOUT BOOTS

A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover, and tamper proof fasteners.
   1. Configuration: varies based on site condition.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Finish: Manufacturer's standard factory applied powder coat finish.
   4. Color: To be selected by Architect from manufacturer's standard range.
   5. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, integral neoprene gaskets, and rubber coupling.
   6. Manufacturers:
      a. Downspoutboots.com, a division of J. R. Hoe & Sons; ____: www.downspoutboots.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items specified for _____ finish.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

G. Chrome Plating: ASTM B177/B177M, nickel-chromium alloy, satin finish.

2.07 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: as selected by Architect.

2.08 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 51 00

METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Structural steel stair framing and supports.

C. Handrails and guards.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.

B. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

C. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

D. Section 04 29 00 - Engineered Unit Masonry: Placement of metal fabrications in masonry.

E. Section 05 50 00 - Metal Fabrications.

F. Section 05 52 13 - Pipe and Tube Railings: Metal handrails and balusters other than specified in this section.

G. Section 09 91 23 - Interior Painting: Paint finish.

H. Section 10 14 00 - Signage: Photoluminescent markings.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2017.

J. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2018.

K. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

M. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

N. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

O. UL 1994 - Luminous Egress Path Marking Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Design Data: As required by authorities having jurisdiction.

D. Welders' Certificates.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in Tennessee, or personnel under direct supervision of such an engineer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Custom Metal Stair Fabricators:

B. Unit Stair Towers:

2.02 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
   2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   3. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
   4. At exit stairwells, provide unit stair towers designed for stacking to height of building as a self-supporting structure.
   5. Photoluminescent Stair Accessories: Comply with applicable building code.
   6. Dimensions: As indicated on drawings.
   7. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   8. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   9. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
      a. Welded Joints: Continuously welded and ground smooth and flush.
      b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
      c. Exposed Edges and Corners: Eased to small uniform radius.
      d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

2. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
    a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
    b. Welds Exposed to View: Ground smooth and flush.
    c. Mechanical Joints: Butted tight, flush, and hairline.
    d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
    e. Exposed Edges and Corners: Eased to small uniform radius.
    f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.
3. Service: Exposed joints tight with face surfaces aligned; underside of stair not covered by soffit is not considered exposed to view.
    a. Welded Joints: Welded on back side wherever possible.
    b. Welds Exposed to View: Ground smooth; not required to be flush.
    c. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts or screw threads.
    d. Metal Surfaces to be Painted: Sanded smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.03 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
1. Concrete Depth: 1-1/2 inches, minimum.
2. Tread Pan Material: Steel sheet.
3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
4. Factory Fabricated Tread and Nosing: Manufacturer's standard, field applied aluminum walking surface with integral nosing, abrasive filler and factory applied finishes.
5. Pan Anchorage to Stringers: Welded or bolted to carrier angles welded or bolted to stringers.
6. Concrete Reinforcement: None.
7. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
1. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.
2. Riser/Nosing Profile: Vertical riser with underside of nosing sloped up from bottom of tread pan at not less than 60 degrees from horizontal, with rounded top of nosing of minimum radius.
3. Nosing Depth: Not more than 1-1/2 inch overhang.
4. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: Rolled steel channels.
1. Stringer Depth: 10 inches.
2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Railings: as indicated on drawings.

G. Finish: Shop- or factory-prime painted.

H. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.04 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.

1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

B. Guards:
   1. Top Rails: Round pipe or tube rails unless otherwise indicated.
      a. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.
   2. Infill at Picket Railings: Horizontal Rail Pickets
      a. Horizontal Spacing: Maximum 4 inches on center.
      b. Material: Solid steel bar.
      c. Shape: Square.
      d. Size: 1/2 inch square.
      e. Top Mounting: Welded to underside of top rail.
      f. Bottom Mounting: Welded to top surface of stringer.
   3. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
      a. Outside Diameter: 1 inch.
      b. Material: Steel pipe or tube, round.
      c. Vertical Spacing: Maximum 4 inches on center.
      d. Jointing: Welded and ground smooth and flush.
   4. End and Intermediate Posts: Same material and size as top rails. Vertical posts on interior stringers to be HSS round 1.66x.14 or pipe, 1-1/2" diameter schedule 40.
      a. Horizontal Spacing: As indicated on drawings.
      b. Mounting: Welded to top surface of stringer.

2.05 MATERIALS

A. Steel Sections: ASTM A36/A36M or A992

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
   1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
   2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

E. Concrete Fill: Type specified in Section 03 30 00.

F. Concrete Fill: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.

G. Concrete Reinforcement: Mesh type as detailed, galvanized.

2.06 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.07 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 52 13

PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Free-standing railings at steps.

D. Balcony railings and guardrails.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.

C. Section 05 51 00 - Metal Stairs: Handrails other than those specified in this section.

D. Section 05 51 00 - Metal Stairs: Attachment plates for handrails specified in this section.

E. Section 06 20 00 - Finish Carpentry: Wood handrail.

F. Section 09 21 16 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

G. Section 09 91 13 - Exterior Painting: Paint finish.

H. Section 09 91 23 - Interior Painting: Paint finish.

I. Section 10 14 00 - Signage: Photoluminescent markings.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

E. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2016.

F. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2010e1.

G. ASTM B483/B483M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications; 2013, with Editorial Revision (2014).

H. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013, with Editorial Revision.

I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

C. Samples: Submit two, 6 inch long samples of handrail. Submit one samples of elbow, wall bracket, and end stop.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Handrails and Railings:
   1. Superior Aluminum Products, Inc; Series 9H Aluminum Horizontal Railing: www.superioraluminum.com
   2. Alumi-Guard; ____: www.alumi-guard.com/#sle.
   3. ATR Technologies Inc; Aluminum Multi-Line Railing: http://www.atr-technologies.com/#sle.
   4. C.R. Laurence Company, Inc; CRL Welded Post Railing Systems (WRS): www.crl-arch.com/#sle.
   5. KaneSterling; ____: www.sterlingdula.com/#sle.

2.02 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 50 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
   2. Top Rails and Wall Rails: Wood rails, specified in Section 06 20 00.
   3. Intermediate Rails: 1-1/2 inches diameter, round.
   4. Intermediate Rails: 1-1/4 by 1 inch rectangular.
   5. Posts: 1-1/2 inches diameter, round.
   6. Posts: 1-1/2 inches square.
   7. Balusters: 1/2 inch square solid bar.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
   3. For anchorage to stud walls, provide backing plates, for bolting anchors.
   4. Posts: Provide adjustable flanged brackets.

G. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.03 ALUMINUM MATERIALS

A. Aluminum Pipe: Schedule 40; ASTM B429/B429M, ASTM B241/B241M, or ASTM B483/B483M.

B. Aluminum Tube: Minimum wall thickness of 0.127 inch; ASTM B429/B429M, ASTM B241/B241M, or ASTM B483/B483M.

C. Solid Bars and Flats: ASTM B211/B211M.

D. Non-Weld Mechanical Fittings: Slip-on cast aluminum, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

E. Welding Fittings: No exposed fasteners; cast aluminum.

F. Straight Splice Connectors: Concealed spigot; cast aluminum.

G. Exposed Fasteners: No exposed bolts or screws.

2.04 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M, Grade C cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M, Grade B Schedule 80, black finish.

C. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

D. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

E. Exposed Fasteners: No exposed bolts or screws.

F. Straight Splice Connectors: Steel concealed spigots.

G. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.05 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.06 ALUMINUM FINISHES

A. Color: As indicated on drawings.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 52 20
ROOF GUARD PROTECTION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

Provide and install freestanding KeeGuard® Roof Edge Protection System, including pipe railings, uprights, bases, counterweights, fittings and delivery to site.

RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Associated metal supports.

B. Section 07400 - Membrane Roofing: Coordination of roof edge protection installation.

1.2 REFERENCES

A. American National Standards Institute (ANSI) - A21.l Safety Requirements for Floor and Wall Openings, Railings and Toe Boards.

B. American National Standards Institute (ANSI) - A58.l Minimum Design Loads in Buildings and Other Structures.

C. American National Standards Institute (ANSI) - Al 17.1 Accessible and Usable Buildings and Facilities.

D. American Society of Testing and Materials (ASTM) A47 - Standard Specification for Ferrite Malleable Iron Castings.

E. American Society of Testing and Materials (ASTM) A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

F. American Society of Testing and Materials (ASTM) A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

G. American Society of Testing and Materials (ASTM) A500 - Standard Specification for cold-formed welded and seamless carbon steel structural tubing.

H. Occupational Safety & Health Administration (OSHA): 1910.23 - Guarding Floor and Wall Openings and Holes.

1.3 SUBMITTALS

. Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Shop Drawings: Indicate profiles, sizes, connections, size and type of fasteners and accessories.
3. Field Measurements: Verify field measurements prior to assembly and/or ordering.

Storage and handling requirements and recommendations.

4. Installation Instruction.

B. Shop Drawings: Drawings showing fabrication and installation of handrails and guardrails including plans, elevations, sections, details of components, anchor details, and attachment to adjoining units of work.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.4 QUALITY ASSURANCE

A. Railings Structural Requirements:

1. Handrail, wall rail and guardrail assemblies and attachments shall withstand a minimum concentrated load of 200 pounds (90719 g) applied in any direction on the top rail.
2. Infill area of guardrail system capable of withstanding a horizontal concentrated load of 200 pounds (90719 g) applied to one square foot (8165 g/sm) at any point in the system. Load not to act concurrently with loads on top rail of system in determining stress on guardrail.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Materials to be delivered to the job site in good condition and adequately protected against damage as handrails are a finished product.

B. Store products in manufacturer's unopened packaging until ready for installation.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings.

1. Where field measurements cannot be made without delaying the railing fabrication and delivery, obtain guaranteed dimensions in writing by the Contractor and proceed with fabrication of products to not delay fabrication, delivery and installation.

C. Coordinate fabrication and delivery schedule of handrails with construction progress and sequence to avoid delay of railing installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Kee Safety, Inc., which is located at: 100 Stradtman St. ; Buffalo, NY 14206; Toll Free Tel: 800-851-5181; Tel: 716-896-4949; Fax: 716-896-5696; Email: info@keesafety.com; Web: www.keesafety.com

B. Substitutions: Not permitted.

2.2 SYSTEMS

A. Provide pipe or tubing, fittings, and accessories as indicated or required to match design indicated on the Drawings.

1. Fittings: Cast iron.
2. Handrail Tubing, 12 gauge, Size
   a. 1-1/2 inches - 1.90 inches O D.
   b. 1-1/4 inches – 1.660 inches O D.

3. Handrail Pipe, Schedule 40, Size:
   a. 1-1/2 inches - 1.90 inches (48 mm) O D.
   b. 1-1/4 inches – 1.660 inches (38 mm) O D.
4. Infill Panels: As indicated. Refer to Drawings.

B. Roof Edge Protection: Provide freestanding KeeGuard Roof Edge Protection System, including pipe railings, uprights, bases, counterweights and fittings.

1. Freestanding counterweighted guardrail system with 42 inch (1067 mm) minimum height to provide a pedestrian egress barrier on the roof to withstand a minimum load of 200 lb (90719 g) in any direction to the top rail per OSHA Regulation 29 CFR 1910.23.
2. Pipe: Steel, 1-1/2 inches (48 mm) schedule 40, galvanized.
3. Tube: Galvanized tube, 12 gauge, 1-1/2 inches, 1.90 inches (48 mm) OD.
4. Rails and Posts: Galvanized Tube, 12 gauge, 1-1/2 inches 1.90 inches (38 mm) diameter.
5. Counterweight Levers: Galvanized Tube, 12 gauge, 1-1/4 inches 1.660 inches (38 mm) diameter.
6. Mounting Bases: Steel bases are galvanized and are supplied with a rubber pad on underside of the component.
7. Counterweights: Molded recycled PVC with one fixing collar per counterbalance.
8. Fasteners: stainless steel or galvanized.

C. Custom Design: Provide pipe, fittings, and accessories as indicated or required by Drawings to match design indicated.

2.3 MATERIALS

A. Pipe:
   1. Steel Pipe: Steel, 1-1/2 inches (38 mm) schedule 40, galvanized.
   2. Tube: Galvanized tube, 12 gauge, 1-1/2 inches, 1.90 inches (48 mm) OD.

B. Fittings, Including Elbows, Crossovers, Wall flanges, Tees, Couplings:
   1. Galvanized Malleable Cast Iron: Kee Klamp structural pipe fittings, ASTM A447 with ASTM A153 galvanizing.

C. Finish: Polyester factory applied spray coating.

D. Fasteners: Type 304 or 305 stainless steel or galvanized.

2.4 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to site.

B. Upright tops shall be plugged with weather and light resistant material.

C. Assemble components with joints tightly fitted and secured. Accurately form components to suit installation.

PART 3 EXECUTION

3.1 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Fit exposed connections accurately together to form tight joints. For all connections with Kee Klamp fittings, each set screw is to be tightened to 29 foot pounds (39 N-m) of torque.

C. Perform cutting, and fitting required for installation of handrails. Set handrails and accurately in location, alignment, and elevation, measured from established lines and levels.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 06 05 73
WOOD TREATMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Site applied termiticide for wood materials.

B. Site applied termiticide for other building materials.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions .

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 06 10 00 - Rough Carpentry: Factory treatment for wood products.

D. Section 06 15 00 - Wood Decking: Factory treatment for wood products.

E. Section 06 17 33 - Wood I-Joists: Factory treatment for wood products.

F. Section 06 17 36 - Metal-Web Wood Joists: Factory treatment for wood products.

G. Section 06 17 53 - Shop-Fabricated Wood Trusses: Factory treatment for wood products.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in KCDC's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for applied materials.

PART 2 PRODUCTS

2.01 SITE-APPLIED WOOD TREATMENT

A. Manufacturers:
   1. Substitutions: See Section 01 60 00 - Product Requirements.

B. Site Applied Termiticide for Wood: Borate mineral salt based, spray applied, penetrating termiticide.
   1. Products:
      a. Nisus Corporation; Bora-Care: www.nisuscorp.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Site Applied Termiticide for Wood, Steel and Concrete: Borate mineral salt based, spray applied termiticide formulated for use on wood, steel, concrete and other building materials.
   1. Active Ingredient: 40% minimum disodium octaborate tetrahydrate (DOT).
   2. Carrier and Penetrant: Proprietary glycol solution.
   3. Products:
      a. Nisus Corporation; Bora-Care: www.nisuscorp.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove dust, dirt and other contaminants from treatment surfaces. Remove tarpaulins, dropcloths, strippable protective films, etc., from areas to be treated Move equipment and stored materials that block or prevent product application.

3.02 INSTALLATION - GENERAL

A. Provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 SITE APPLIED WOOD TREATMENT

A. Comply with manufacturers written mixing and installation instructions.

B. Termiticide: Apply to foundations, structure and other items as listed.
   1. All structural wood and sill plates within 24 inches, minimum, of point of contact with foundation.
   2. All wood, wood based and cellulosic sheathing within 24 inches, minimum, of point of contact with foundation.
   3. Concrete foundations 2 inches, minimum, from sill plate.
   4. All pipe and plumbing penetrations up to 24 inches, minimum, above slab and slab surface within 6 inches, minimum, of pipe or penetration.
   5. Concrete or masonry crawlspace walls up to 24 inches, minimum, from top of soil.
   6. Concrete or masonry basement walls up to 24 inches, minimum, from top of soil.
   7. Six inches, minimum, on either side of control joints and construction joints in slabs and joints between slabs and abutting material.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rough opening framing for doors, windows, and roof openings.

B. Sheathing.

C. Subflooring.

D. Underlayment.

E. Roof-mounted curbs.

F. Roofing nailers.

G. Roofing cant strips.

H. Preservative treated wood materials.

I. Fire retardant treated wood materials.

J. Miscellaneous framing and sheathing.

K. Communications and electrical room mounting boards.

L. Concealed wood blocking, nailers, and supports.

M. Miscellaneous wood nailers, furring, and grounds.

N. Wall sheathing with factory applied water-resistive and air barrier sheet.

O. Roof sheathing with factory applied roofing underlayment.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.

C. Section 03 54 00 - Cast Underlayment.

D. Section 05 12 00 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.

E. Section 05 50 00 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

F. Section 06 15 00 - Wood Decking.

G. Section 06 17 33 - Wood I-Joists.

H. Section 06 17 36 - Metal-Web Wood Joists.

I. Section 06 17 53 - Shop-Fabricated Wood Trusses.

J. Section 07 25 00 - Weather Barriers: Air barrier over sheathing.

K. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

L. Section 07 62 00 - Sheet Metal Flashing and Trim: Sill flashings.

M. Section 07 72 00 - Roof Accessories: Prefabricated roof curbs.

N. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

O. Section 31 31 16 - Termite Control: Field-applied termiticide and mildewcide for wood materials.

1.03 REFERENCE STANDARDS

A. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2015.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

D. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).

E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2018a.

F. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

G. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

H. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2018a.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

J. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

K. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

L. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems; 2014, with Editorial Revision (2017).

M. PS 1 - Structural Plywood; 2009.

N. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

O. PS 20 - American Softwood Lumber Standard; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Southern Pine, unless otherwise indicated.
   2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
   4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. Lumber salvaged from deconstruction or demolition of existing buildings or structures is permitted in lieu of sustainably harvested lumber provided it is clean, denailed, and free of paint and finish materials, and other contamination; identify source.
   1. Where salvaged lumber is used for structural applications, provide lumber re-graded by an inspection service accredited by the American Lumber Standard Committee, Inc; www.alsc.org.

C. Lumber fabricated from recovered timber (abandoned in transit) is permitted in lieu of sustainably harvested lumber, unless otherwise noted, provided it meets the specified requirements for new lumber and is free of contamination; identify source.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Southern Pine.
   2. Grade: No. 2.

E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
   1. Machine stress-rated (MSR) as follows:
      a. Fb-single (minimum extreme fiber stress in bending): 1350 psi.
      b. E (minimum modulus of elasticity): 1,300,000 psi.
   2. Species and Grades: As indicated on drawings for various locations.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Subfloor/Underlayment Combination: Any PS 2 type, rated Single Floor.
   1. Bond Classification: Exterior.
   2. Span Rating: as indicated on drawings.
   3. Performance Category: 1-1/8 PERF CAT.
   4. Edges: as indicated on drawings.

B. Subfloor/Underlayment Combination: Oriented strand board wood structural panel; PS 2, rated Single Floor.
   1. Bond Classification: Exterior.
   2. Performance Category: 19/32 PERF CAT.
   3. Span Rating: as indicated on drawings.
   4. Edges: Square.
   5. Surface Finish: Fully sanded face.
   6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 200 days.
   7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches, 19.2 inches and 24 inches on center, respectively.
   8. Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.
   9. Manufacturers:
      a. Weyerhaeuser Company: www.weyerhaeuser.com
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Subflooring: Any PS 2 type, rated Sheathing.
   1. Bond Classification: Exterior.
   2. Span Rating: 48.
   3. Performance Category: 3/4 PERF CAT.

D. Roof Sheathing: Any PS 2 type, rated Structural I Sheathing.
   1. Bond Classification: Exterior.
   2. Span Rating: as indicated on drawings.
   3. Performance Category: 3/4 PERF CAT.

E. Wall Sheathing: Any PS 2 type.
   1. Bond Classification: Exterior.
   2. Grade: Structural I Sheathing.
   3. Span Rating: 24.
   4. Performance Category: 5/16 PERF CAT.
   5. Edge Profile: Square edge.

F. Wall Sheathing: Plywood, PS 1, Grade C-D, Exposure I.

G. Wall Sheathing: See Section 09 21 16.

H. Wall Sheathing: Gypsum, complying with requirements of ASTM C1396/C1396M for gypsum sheathing, V-shaped long edges, 5/8 inch Type X fire resistant.

I. Wall Sheathing: High pressure laminated cellulose fiber construction panel laminated to insulation board.
   1. Construction Panel with Insulation Board: Laminated cellulose fiberboard and polyisocyanurate foam plastic with coated, laminated paper facer on major surface opposite fiberboard.
   2. Panel Thickness: 1 inch.
   3. Manufacturers:
      a. Ox Engineered Products; Structural Insulated Sheathing (Styrofoam SIS): www.oxengineeredproducts.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

J. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
   3. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

E. Termite-Resistant Sill Plate Barrier: Self-adhesive, film-backed barrier with release sheet; adheres to concrete substrates and blocks termite access.
   1. Thickness: 68 mils (0.068 inch).
   2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
   3. Water Vapor Permeance: 0.035 perm, maximum, when tested in accordance with ASTM E96/E96M.
   4. Manufacturers:
      a. Polyguard Barrier Systems, Inc, a division of Polyguard Products, Inc; TERM Sill Plate Barrier: www.polyguardbarriers.com

b. Substitutions: See Section 01 60 00 - Product Requirements.

F. Termite-Resistant Sill Flashing: Self-adhesive membrane; polyethylene film bonded to sealant.
1. Thickness: 40 mils (0.040 inch).
2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
3. Water Vapor Permeance: 0.035 perm, maximum, when tested in accordance with ASTM E96/E96M.
4. Manufacturers:
a. Polyguard Barrier Systems, Inc, a division of Polyguard Products, Inc; TERM Flashing Barrier: www.polyguardbarriers.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

G. Sill Flashing: As specified in Section 07 62 00.

H. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.
1. Manufacturers:
a. Franklin International, Inc; Titebond PROvantage Weatherproof Subfloor Adhesive: www.titebond.com/#sle.
b. Huber Engineered Woods, LLC; AdvanTech Subfloor Adhesive: www.huberwood.com/#sle.
c. Liquid Nails, a brand of PPG Architectural Coatings; LN-950 Polyurethane Adhesive (Low VOC): www.liquidnails.com
d. Substitutions: See Section 01 60 00 - Product Requirements.

I. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.
1. Manufacturers:
a. Franklin International, Inc; Titebond Fast Set Polyurethane Construction Adhesive: www.titebond.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

J. General Purpose Construction Adhesives:
1. Manufacturers:
a. ADFAST Corporation; ADBOND EX 5690: www.adfastcorp.com
b. Substitutions: See Section 01 60 00 - Product Requirements.

K. Water-Resistive Barrier: As specified in Section 07 25 00.

L. Building Paper: Water resistant Kraft paper.

M. Termite Shield: Galvanized sheet steel

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
1. Manufacturers:
a. Lonza Group; www.wolmanizedwood.com
b. Hoover Treated Wood Products, Inc: www.frtw.com
c. Koppers, Inc; www.koppersperformancechemicals.com
d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion

when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
    a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
    b. Treat all exterior rough carpentry items.
    c. Do not use treated wood in direct contact with the ground.
3. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
    a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
    b. Treat rough carpentry items as indicated .
    c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
1. Manufacturers:
    a. Lonza Group; www.wolmanizedwood.com
    b. Koppers Performance Chemicals, Inc; www.koppersperformancechemicals.com
    c. Viance, LLC; Preserve ACQ: www.treatedwood.com
    d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
    a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
    b. Treat lumber exposed to weather.
    c. Treat lumber in contact with roofing, flashing, or waterproofing.
    d. Treat lumber in contact with masonry or concrete.
    e. Treat lumber less than 18 inches above grade.
3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
    a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
    b. Treat plywood in contact with roofing, flashing, or waterproofing.
    c. Treat plywood in contact with masonry or concrete.
    d. Treat plywood less than 18 inches above grade.
4. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
    a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
    b. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

C. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual, and as indicated on drawings.

E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.

H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fire-blocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Wall paneling and trim.
   8. Joints of rigid wall coverings that occur between studs.

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

B. Subflooring: Glue and nail to framing; staples are not permitted.

C. Underlayment: Secure to subflooring with nails and glue.
   1. At locations where resilient flooring will be installed, fill and sand splits, gaps, and rough areas.
   2. Place building paper between floor underlayment and subflooring.

D. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. At long edges use sheathing clips where joints occur between roof framing members.
   2. Nail panels to framing; staples are not permitted.

E. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
   1. Use plywood or other acceptable structural panels at building corners, for not less than 96 inches, measured horizontally.
   2. Provide inlet diagonal bracing at corners.
   3. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

F. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size: 48 by 96 inches, installed horizontally at ceiling height.

3.07 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.08 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.09 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

3.10 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 74 19 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 15 00
WOOD DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Softwood lumber structural wood decking.

B. Plywood structural wood decking.

C. Fire retardant treatment of wood.

D. Preservative treatment of wood.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Bearing support.

C. Section 04 20 00 - Unit Masonry: Bearing support.

D. Section 06 10 00 - Rough Carpentry: Bearing support.

1.03 REFERENCE STANDARDS

A. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

D. PS 1 - Structural Plywood; 2009.

E. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SYSTEM DESCRIPTION

A. Design floor live and dead load: as indicated on drawings psf with deflection limited to as indicated on drawings of span.

B. Design roof live and dead load: as indicated on drawings psf with deflection limited to as indicated on drawings of span.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials.

C. Shop Drawings: Indicate deck framing system, loads and cambers, bearing details, and framed openings.
   1. Include the design engineer's seal and signature on each sheet of shop drawings.

1.06 QUALITY ASSURANCE

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect glue laminated members in accordance with AITC 111 requirements for unwrapped material.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plywood Decking:
   1. Boise Cascade Company; ____: www.bc.com/#sle.
   2. Georgia-Pacific LLC; ____: www.buildgp.com/#sle.
   3. Weyerhaeuser Company; ____: www.weyerhaeuser.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 WOOD MATERIALS

A. Wood fabricated from old growth timber is not permitted.

B. Regulatory Requirements:
   1. Comply with applicable code for fire retardant requirements.
   2. Comply with UL (FRD) requirements for Assembly No. as indicated on drawings, to achieve rating indicated.

C. Marking: Mark each piece with producer's stamp indicating compliance with specified requirements; for pieces exposed to view in completed construction, submit manufacturer's certificate certifying that products comply with specified requirements in lieu of grade stamping.

D. Plywood Decking: PS 1 veneer plywood; APA Rated Sheathing, Span Rating as indicated on drawings; Exterior grade;1 A interior veneer appearance grade; sanded.

2.03 ACCESSORIES

A. Fasteners and Anchors:
   1. Fastener Type and Finish: Hot-dipped galvanized steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Fastener Type and Finish for Composite Decking: Stainless steel, trim head.
   3. Screws: Bugle head, hardened steel, power driven type, length three times thickness of decking.
   4. Anchors: Toggle bolt type for anchorage to hollow masonry.

2.04 WOOD TREATMENT

A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

B. Fire Retardant Treatment:
   1. Manufacturers:
      a. Hoover Treated Wood Products, Inc; ____: www.frtw.com/#sle.
      b. Lonza Group; ____: www.wolmanizedwood.com/#sle.
      c. Koppers, Inc; _____: http://www.koppersperformancechemicals.com/#sle.
      d. Osmose Utilities Services, Inc; ____: www.osmose.com/#sle.
      e. Viance, LLC; D-Blaze: www.treatedwood.com/#sle.
      f. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Exterior Type: AWPA U1, Use Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; with maximum flame spread index of 25 when tested in accordance with ASTM E84 and with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
   3. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; maximum flame spread index of 25 when tested in accordance with ASTM E84 and with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Do not use Type A treated wood in applications exposed to weather or where the wood may become wet.
   4. Marking: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

C. Surface-Applied Wood Preservative:

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that support framing is ready to receive decking.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.

B. Brush apply one coats of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.04 INSTALLATION - PLYWOOD DECKING

A. Install decking perpendicular to framing members with ends staggered over firm bearing. On sloped surfaces, lay decking with tongue upward.

B. Engage plywood tongue and groove edges.

C. Allow expansion space at edges and ends.

D. Attach decking with adhesive and screws.

E. Use sheathing clips at unsupported edges of plywood between supporting framing members.

F. Cut decking to accommodate roof drain and flange.

3.05 TOLERANCES

A. Surface Flatness of Decking Without Load: 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

END OF SECTION

SECTION 06 17 33
WOOD I-JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood I-joists for roof and floor framing.

B. Bridging, bracing, and anchorage.

C. Framing for openings.

D. Preservative treatment of wood.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 10 00 - Rough Carpentry: Installation requirements for miscellaneous framing.

C. Section 06 10 00 - Rough Carpentry: Material requirements for blocking, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS

A. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a (Reapproved 2018).

B. ASTM D5055 - Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists; 2016.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

D. PS 1 - Structural Plywood; 2009.

E. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

1.04 DESIGN REQUIREMENTS

A. Design Floor Live and Dead Load: as indicated on drawings lbs/sq ft with deflection limited to as indicated on drawings of span.

B. Design Roof Live and Dead Load: as indicated on drawings lbs/sq ft with deflection limited to as indicated on drawings of span.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.

C. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.

D. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.

B. Protect products from damage due to weather and breakage.

C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.

D. Handle individual joists in the upright position.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood I-Joists:
   1. Boise Cascade Company; ____: www.bc.com/#sle.
   2. Louisiana-Pacific Corporation; ____: www.lpcorp.com/#sle.
   3. Weyerhaeuser Company; ____: www.weyerhaeuser.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Wood I-Joists: Solid lumber top and bottom flanges and oriented strand board (OSB) webs bonded together with structural adhesive, with published span rating to meet project requirements.
   1. Span Rating: Established and monitored in accordance with ASTM D5055 by independent inspection agency.
   2. Oriented Strand Board: Comply with PS 2.
   3. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
   4. Depth: As indicated on drawings.
   5. Fabrication Tolerances:
      a. Flange Width: Plus/minus 1/32 inch.
      b. Flange Thickness: Minus 1/16 inch.
      c. Joist Depth: Plus 0, minus 1/8 inch.
   6. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.
   7. Provide bearing stiffeners if required by span rating or joist hanger manufacturer.

B. Wood-Based Components:
   1. Wood fabricated from old growth timber is not permitted.

C. Joist Hangers: as indicated on drawings.

D. Joist Bridging: Type, size and spacing recommended by joist manufacturer.

E. Wood Blocking, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, maximum moisture content of 19 percent.

F. Wood Blocking, Plates, and Miscellaneous Framing: As specified in Section 06 10 00.

G. Fasteners: Electrogalvanized steel, type to suit application.

H. Bearing Plates: Electrogalvanized steel, unfinished.

2.03 WOOD TREATMENT

A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports and openings are ready to receive joists.

B. Verify that field measurements are as indicated on shop drawings.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

A. Install joists in accordance with manufacturer's instructions.

B. Set structural members level and plumb, in correct position.

C. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without approval of Architect.

E. Install permanent bridging and bracing.

F. Install headers and supports to frame openings required.

G. Frame openings between joists with lumber in accordance with Section 06 10 00.

H. Coordinate installation of sheathing/decking with work of this section.

3.04 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.

B. Brush apply one coat of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.05 TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06 17 53

SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated wood trusses for roof and floor framing.

B. Bridging, bracing, and anchorage.

C. Fire retardant treatment of wood.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 10 00 - Rough Carpentry: Installation requirements for miscellaneous framing.

C. Section 06 10 00 - Rough Carpentry: Material requirements for blocking, bridging, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

B. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

E. SPIB (GR) - Grading Rules; 2014.

F. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2014.

G. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses; 2018.

H. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.

C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
   1. Include identification of engineering software used for design.
   2. Provide shop drawings stamped or sealed by design engineer.
   3. Submit design calculations.

D. Designer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural _____ Engineer experienced in design of this Work and licensed in Tennessee.

B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle and erect trusses in accordance with TPI BCSI 1.

B. Store trusses in vertical position resting on bearing ends.

C. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Truss Plate Connectors:
   1. Alpine, an ITW Company; ____: www.alpineitw.com/#sle.
   2. MiTek Industries, Inc; ____: www.mii.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Truss Fabricators:
   1. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 TRUSSES

A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
   1. Species and Grade: Southern Pine, SPIB (GR) Grade as indicated on drawings.
   2. Connectors: Steel plate.
   3. Structural Design: Comply with applicable code for structural loading criteria.
   4. Floor Deflection: 1/360, maximum.
   5. Roof Deflection: 1/240, maximum.
   6. Fire Retardance: Comply with applicable code(s); provide factory pressure treated wood.
   7. Minimum Truss Depth: as indicated on drawings inch.

2.03 MATERIALS

A. Lumber:
   1. Moisture Content: Between 7 and 9 percent.
   2. Lumber fabricated from old growth timber is not permitted.

B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.

C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.04 ACCESSORIES

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 06 10 00.

B. Fasteners: Electrogalvanized steel, type to suit application.

C. Bearing Plates: Electrogalvanized steel.

2.05 WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

B. Fire Retardant Treatment, Exterior Type: AWPA U1, Use Category UCFB, Commodity Specification H, chemically treated and pressure impregnated, maximum flame spread index of 25 when tested in accordance with ASTM E84 and with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898; kiln dried after treatment to maximum moisture content of 19 percent for lumber and 15 percent for plywood.

C. Fire Retardant Treatment, Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated, maximum flame spread index of 25 when tested in accordance with ASTM E84

and with no evidence of significant combustion when test is extended for an additional 20 minutes; kiln-dried after treatment to maximum moisture content of 19 percent for lumber and 15 percent for plywood.

1. Marking: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
2. Products:
   a. Koppers, Inc; _____: http://www.koppersperformancechemicals.com/#sle.
   b. Viance, LLC; D-Blaze: www.treatedwood.com/#sle.
   c. Substitutions: See Section 01 60 00 - Product Requirements.

D. Preservative Pressure Treatment of Lumber: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
   1. Kiln dry after treatment to maximum moisture content of 19 percent.
   2. Marking: Mark each piece with stamp of an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

E. Field-Applied Fire-Retardant Treatment:

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.

B. Set members level and plumb, in correct position.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without approval of Architect.

E. Install permanent bridging and bracing.

F. Install headers and supports to frame openings required.

G. Frame openings between trusses with lumber in accordance with Section 06 10 00.

H. Coordinate placement of decking with work of this section.

I. After erection, touch-up primed surfaces with primer consistent with shop coat.

3.04 SITE APPLIED WOOD TREATMENT

A. Treat all site-sawn cuts of pressure-treated wood using same type of treatment (i.e. preservative or fire-retardant).

B. Apply fire-retardant treatment to all exposed surfaces after erection (if needed).

C. Apply treatment in accordance with manufacturer's instructions.

D. Allow field-applied treatment to dry prior to erecting members.

3.05 TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood door frames, glazed frames.

C. Wood casings and moldings.

D. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 06 41 00 - Architectural Wood Casework: Shop fabricated custom cabinet work.

D. Section 08 14 33 - Stile and Rail Wood Doors.

E. Section 09 91 13 - Exterior Painting: Painting of finish carpentry items.

F. Section 09 91 23 - Interior Painting: Painting of finish carpentry items.

G. Section 09 93 00 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

H. Section 12 35 30 - Residential Casework: Shop fabricated cabinet work.

1.03 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program; Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2018).

D. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide the information required by AWI/AWMAC/WI (AWS).
   3. Include certification program label.

C. Provide Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards and locksets, demonstrating hardware design, quality and finish.

F. Samples: Submit one samples of wood trim 6 inch long.

G. Manufacturer's Instructions: Provide manufacturer's installation instructions for factory-fabricated units.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
   2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
   3. Single Source Responsibility: Provide and install this work from single fabricator.

B. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
   2. Provide labels or certificates indicating that the work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
   3. Provide designated labels on shop drawings as required by certification program.
   4. Provide designated labels on installed products as required by certification program.
   5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.

B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

C. Protect from moisture damage.

D. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Exterior Woodwork Items:
   1. Enclosing Soffit Spaces: As detailed.
   2. Enclosing Structural Members: Softwood lumber; "PT" preservative treated.

D. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.
   2. Door, Glazed Light, and Pocket Door Frames: White birch; prepare for paint finish.
   3. Window Sills: Clear fir; prepare for paint.
   4. Stairs, Balustrades, and Handrails: Refer to drawings for end finish.

E. Manufactured Attic Stairs:
   1. Products:
      a. FAKRO America LLC; Attic Ladder LWF: www.fakrousa.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3; color as selected by Architect; finish as selected.
   1. Products:

a. Wilson Art; https://www.wilsonart.com See drawings for additional information.

B. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.03 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Adhesive for factory-fabricated units: Manufacturer's recommended adhesive for application.

C. Fasteners: Of size and type to suit application; selected by Architect finish in concealed locations and selected by Architect finish in exposed locations.

D. Fasteners for Exterior Applications: selected by Architect; length required to penetrate wood substrate 1-1/2 inch minimum.

E. Concealed Joint Fasteners: Threaded steel.

2.04 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Lumber for Shimming and Blocking: Softwood lumber of yellow pine species.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.05 HARDWARE

A. Hardware: Comply with BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chroms finish for a nominal 1 inch spacing adjustements.

C. Drawer and Door Pulls: As specified on drawings.

D. Drawer Slides: As specified on drawings. Include self closing/ stay closed type. Slides to be side mounted, commercial grade with integral type stops.

E. Hinges: European style concealed self-closing type.

F. Standard Shelf, Countertop, and Workstation Brackets:
1. Material: Steel.

G. Americans with Disabilities Act (ADA)-Compliant Vanity and Countertop Brackets:
1. Material: Steel.
2. Color: Selected by Architect from manufacturer's standard range.
3. Products:
a. A&M Hardware, Inc ; ADA Vanity Brackets: http://www.aandmhardware.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 SITE FINISHING MATERIALS

A. Stain, Shellac, Varnish, and Finishing Materials: In compliance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.07 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Cap exposed plastic laminate finish edges with material of same finish and pattern.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

2.08 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Sheen: Flat.
   2. Opaque:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Color: As selected by Architect.
      c. Sheen: Flat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

C. Provide blocking for installation of recessed wood blocking.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Install factory-fabricated units in accordance with manufacturer's printed installation instructions.

C. Set and secure materials and components in place, plumb and level.

D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

E. Adjusting installed work.

F. Adjust moving or operating parts to function smoothly and correctly.

G. Clean casework, counters, shelves, hardware, fittings, trim and fixtures.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Countertops.

C. Hardware.

D. Factory finishing.

E. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2018).

C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide the information required by AWI/AWMAC/WI (AWS).
   3. Include certification program label.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
   2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.

2. Provide designated labels on shop drawings as required by certification program.
3. Provide designated labels on installed products as required by certification program.
4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
5. Replace, repair, or rework all work for which certification is refused.

1.07 MOCK-UP

A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.09 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Echelon Cabinetry, http://www.echeloncabinetry.com/. Style as indicated on drawings. Finish to be chosen by Architect.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Wood Veneer Faced Cabinet:
1. Exposed Surfaces: HPVA HP-1 Grade A, Ash, plain sliced, random-matched.
2. Semi-Exposed Surfaces: HPVA HP-1 Grade B, Ash, plain sliced, random-matched.

C. Plastic Laminate Faced Cabinets: Custom grade.

D. Cabinets:
1. Cabinet Design Series: As indicated on drawings.
2. Adjustable Shelf Loading: 50 lbs. per sq. ft.
3. Cabinet Style: As scheduled.
4. Cabinet Doors and Drawer Fronts: Style as scheduled.

2.03 LAMINATE MATERIALS

A. Manufacturers:
1. Wilsonart LLC: www.wilsonart.com

2.04 COUNTERTOPS

A. Countertops are specified in Section 12 36 00.

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.
1. Manufacturers:
a. Franklin International, Inc; Titebond Original Wood Glue: www.titebond.com

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

2.06 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self-rests, polished chrome finish, for nominal 1 inch spacing adjustments.

C. Fixed Americans with Disabilities Act (ADA)-Compliant Vanity and Countertop Brackets:
   1. Material: Steel.
   2. Color: Selected by Architect from manufacturer's standard range.
   3. Products:
      a. A&M Hardware, Inc ; ADA Vanity Brackets: http://www.aandmhardware.com
      b. Rakks/Rangine Corporation; ADA Compliant Rakks EHV Vanity Supports: www.rakks.com
      c. Substitutions: See Section 01 60 00 - Product Requirements.

D. Fixed Specialty Vanity Brackets:
   1. Material: Steel.
   2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
   3. Manufacturers:
      a. A&M Hardware, Inc; Floating Vanity Brackets: http://www.aandmhardware.com
      b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Countertop Supports:
   1. Material: Aluminum
   2. Finish/Color: Clear anodized.
   3. Manufacturers:
      a. Rakks/Rangine Corporation; Sill Supports: www.rakks.com

F. Drawer and Door Pulls: per drawings.

G. Drawer Slides:
   1. Type: Extension types as indicated.
   2. Mounting: Side mounted.
   3. Stops: Integral type.
   4. Features: Provide self -closing/stay closed type.
   5. Manufacturers:
      a. per manufacturer's specifications.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

H. Drawer Systems: Integrated drawer slide and side.
   1. Side Type: Single Wall.
   2. Drawer Side Height: 3-1/2 inches.
   3. Extension Type: Extension types as indicated.
   4. Static Load Capacity: Residential/Light Commercial grade.
   5. Mounting: Side mounted.
   6. Stops: Integral type.
   7. Features: Provide self -closing/stay closed and white epoxy finish type.

I. Hinges: European style concealed self-closing type, steel with polished finish.

J. Soft Close Adapter: Concealed, frame-mounted, screw-adjustable damper ; steel with polished finish.
   1. Manufacturers:
      a. Echelon Cabinets, http://www.echeloncabinetry.com

2.07 SITE FINISHING MATERIALS

A. Stain, Shellac, Varnish, and Finishing Materials: In compliance with AWI/AWMAC/WI (AWS), unless noted otherwise.

2.08 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.09 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.

C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

D. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:

1. Opaque:
   a. Color: As selected by Architect.
   b. Sheen: Flat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

F. Secure cabinets to floor using appropriate angles and anchorages.

G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 61 00
CAST POLYMER FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cast plastic washroom vanities with integral sink, counter top, and shower stall.

B. Natural quartz and resin composite wall panels.

1.02 RELATED REQUIREMENTS

A. Section 12 36 00 - Countertops: Solid surfacing countertops.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, design load parameters, methods of support, integration of plumbing components, and anchorages.

C. Product Data: Provide data on specified component products, electrical characteristics and connection requirements.

D. Samples: Submit two samples representative of vanity top, 4" x 4" inch in size, illustrating color, texture, and finish.

E. Manufacturer's Installation Instructions: Indicate preparation of opening required, rough-in sizes; provide templates for cast-in or placed frames or anchors; tolerances for item placement, temporary bracing of components.

F. Maintenance Data: Indicate list of approved cleaning materials and procedures required; list of substances that are harmful to the component materials.

G. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 MOCK-UP

A. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the site in original packages, containers or bundles bearing brand name and identification. Protect from damage by retaining shipping protection in place until installation.

B. Store products under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight. Protect from moisture damage.

C. Handle products to prevent damage to edges, ends, or surfaces.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cast Marble Polymer Tub Surrounds & Wall Cladding
   1. Products: Type (WP-1 & SRS)
      a. Mincey Marble; Tub and Shower Panel Systems; Vintage Series.

B. Rocky Tops Granite & Marble Supply:
   1. Products: Type (TOP-3)
      a. Cast Marble Vanity Countertop with Integral Sink.

2.02 MATERIALS

A. Cast Marble Polymer:
   1. Provide finished products having flame spread index of 35 and smoke developed index of 15, when tested in accordance with ASTM E84 in thickness of 3/4 inch.
   2. Resin: Proprietary; integrally-colored, stain-resistant and resistant to domestic chemicals and cleaners.

2.03 FASTENINGS

A. Adhesive: As recommended by the manufacturer for application; not containing formaldehyde or other volatile organic compounds.

2.04 FABRICATION

A. Gel coat the finish exposed surfaces smooth and polish to a gloss sheen.

B. Radius corners and edges.

C. Cure components prior to shipment, except sheet materials requiring site handling.

2.05 FINISH

A. Color: as indicated in finish legend

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and affected dimensions are acceptable.

B. Do not begin installation until substrates have been properly prepared.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Provide anchoring devices for installation and embedding.

3.03 INSTALLATION

A. Install components in accordance with approved shop drawings and manufacturer's instructions.

B. Align work plumb and level.

C. Rigidly anchor to substrate to prevent misalignment.

3.04 TOLERANCES

A. Maximum Variation From True Dimension: 1/8 inch.

B. Maximum Offset From True Position: 1/8 inch.

3.05 CLEANING

A. Clean and polish surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 06 83 16

FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 RELATED REQUIREMENTS

A. Section 09 78 00 - Interior Wall Paneling: Decorative FRP wall paneling.

1.03 REFERENCE STANDARDS

A. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

B. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 4” x 4” inch in size illustrating material and surface design of panels.

D. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Marlite, Inc: www.marlite.com
   2. Panolam Industries International, Inc; Panolam FRP: www.panolam.com
   3. Koroseal; https://koroseal.com

2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: as indicated on drawings
   2. Panel Thickness: .040 inch
   3. Surface Design: Embossed.
   4. Color: as indicated on drawings
   5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

B. Trim: Vinyl; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails, as required.

I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 05 53

FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.

C. Schedule: Completely define scope of proposed marking, and indicate location of affected walls and partitions, and number of markings.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 FIELD CONDITIONS

A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.

B. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Partition Identification Labels:
   1. Fire Wall Signs, Inc; _____: www.firewallsigns.com/#sle.
   2. Safety Supply Warehouse, Inc; _____: www.safetysupplywarehouse.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

B. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 09 91 23 for products.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 PREPARATION

A. See Section 09 91 23 for substrate preparation for painted markings.

3.03 INSTALLATION

A. Locate markings as required by ICC (IBC).

B. Install adhered markings in accordance with manufacturer's instructions.

C. Install applied markings in accordance with Section 09 91 23.

D. Install neatly, with horizontal edges level.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 11 13
BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bituminous dampproofing.

B. Protection boards.

C. Drainage panels.

1.02 RELATED REQUIREMENTS

A. Section 07 21 00 - Thermal Insulation: Rigid insulation board used as protection board.

B. Section 31 23 23 - Fill.

C. Section 33 41 00 - Subdrainage.

1.03 REFERENCE STANDARDS

A. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2018).

B. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide properties of primer, bitumen, and mastics.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bituminous Dampproofing Manufacturers:
   1. Karnak Corporation; _____: www.karnakcorp.com/#sle.
   2. Mar-Flex Systems, Inc; _____: www.mar-flex.com/#sle.
   3. W. R. Meadows, Inc; _____: www.wrmeadows.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 BITUMINOUS DAMPPROOFING

A. Bituminous Dampproofing: Cold-applied, spray-grade; asphalt base, volatile petroleum solvents, and other content, suitable for application by spray, brush, roller, or squeegee; asbestos-free; suitable for application on vertical and horizontal surfaces.
   1. Composition: ASTM D4479/D4479M Type I, minimum, asbestos free.
   2. VOC Content: Not more than permitted by local, State, and federal regulations.
   3. Applied Thickness: 1/16 inch, minimum, wet film.
   4. Products:
      a. W. R. Meadows, Inc; Sealmastic Spray-Mastic: www.wrmeadows.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

2.03 ACCESSORIES

A. Drainage Panel: 1/4 inch thick formed plastic, hollowed sandwich.

B. Protection Board: Rigid insulation specified in Section 07 21 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

3.03 APPLICATION

A. Foundation Walls: Apply two coats of asphalt dampproofing.

B. Perform this work in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

C. Prime surfaces in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

D. Apply bitumen by spray application.

E. Apply from 2 inches below finish grade elevation down to top of footings.

F. Seal items watertight with mastic, that project through dampproofing surface.

G. Place drainage panel directly over dampproofing, butt joints, place to encourage drainage downward.

H. Scribe and cut boards around projections, penetrations, and interruptions.

END OF SECTION

SECTION 07 13 00
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet Waterproofing:
   1. Self-adhered modified bituminous sheet membrane.
   2. Self-adhered TPO sheet membrane.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete substrate.

B. Section 07 21 00 - Thermal Insulation: Insulation used for protective cover.

C. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal parapet, coping, and counterflashing.

D. Section 07 92 00 - Joint Sealants: Sealing moving joints in waterproofed surfaces that are not required to be treated in this section.

E. Section 22 10 06 - Plumbing Piping Specialties: Roof drain and plumbing vent flashing flanges.

1.03 ABBREVIATIONS

A. PVC - Polyvinyl Chloride.

B. TPO - Thermoplastic Polyolefin.

1.04 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.

B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2018).

C. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.

D. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2017).

E. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008, with Editorial Revision (2015).

F. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2019.

G. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes; 1993, with Editorial Revision (2014).

H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

I. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a, with Editorial Revision (2013).

J. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in KCDC's name and registered with manufacturer.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to KCDC.

PART 2 PRODUCTS

2.01 WATERPROOFING APPLICATIONS

A. Self-Adhered Modified Bituminous Sheet Membrane:
   1. Location: below grade foundation wall applications.
   2. Cover with protection board.

2.02 MEMBRANE MATERIALS

A. Self-Adhered Modified Bituminous Sheet Membrane:
   1. Thickness: 60 mil, 0.060 inch, minimum.
   2. Sheet Width: 36 inch, minimum.
   3. Tensile Strength:
      a. Film: 5000 pounds per square inch, minimum, measured according to ASTM D882 and at grip-separation rate of 2 inches per minute.
      b. Membrane: 325 pounds per square inch, minimum, measured according to ASTM D412 Method A, using die C and at spindle-separation rate of 2 inches per minute.
   4. Elongation at Break: 300 percent, minimum, measured according to ASTM D412.
   5. Water Vapor Permeance: 0.05 perm, maximum, measured in accordance with ASTM E96/E96M.
   6. Low Temperature Flexibility: Unaffected when tested according to ASTM D1970/D1970M at minus 20 degrees F, 180 degree bend on 1 inch mandrel.
   7. Peel Strength: 7 pounds per inch, minimum, when tested according to ASTM D903.
   8. Lap Adhesion Strength: 5 pounds per inch, minimum, when tested according to ASTM D1876.
   9. Puncture Resistance: 50 pounds, minimum, measured in accordance with ASTM E154/E154M.
   10. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
   11. Hydrostatic Resistance: Resists the weight of 200 feet when tested according to ASTM D5385/D5385M.
   12. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
   13. Manufacturers:
      a. Carlisle Coatings & Waterproofing Inc; MiraDRI 860/861: www.carlisleccw.com/#sle.
      b. Henry Company; Blueskin WP 200: www.henry.com/#sle.
      c. W.R. Meadows, Inc; MEL-ROL: www.wrmeadows.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

A. Seaming Materials: As recommended by membrane manufacturer.

B. Membrane Sealant: As recommended by membrane manufacturer..

C. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.

D. Protection Board: Rigid insulation as specified in Section 07 21 00.

E. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.
   1. Composition: Dimpled polystyrene, polyethylene, or polypropylene core; polypropylene filter fabric.
   2. Manufacturers:
      a. Epro Services, Inc; ECODRAIN-MS: www.eproserv.com/#sle.

b. Hyload, Inc; HyDrain 200: www.hyload.com/#sle.
c. Mar-flex Waterproofing & Building Products; ArmorDrain 110: www.mar-flex.com/#sle.
d. Mar-flex Waterproofing & Building Products; ArmorDrain 150: www.mar-flex.com/#sle.
e. Mar-flex Waterproofing & Building Products; ArmorDrain 400 Protection/Drainage Board: www.mar-flex.com/#sle.
f. W.R. Meadows, Inc; Mel-Drain 5012: www.wrmeadows.com/#sle.
g. Substitutions: See Section 01 60 00 - Product Requirements.

F. Cant Strips: Premolded composition material.

G. Flexible Flashings: Type recommended by membrane manufacturer.

H. Termination Bars: Aluminum; compatible with membrane and adhesives.

I. Adhesives: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

D. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.

E. Seal moving cracks with sealant and non-rigid filler, using procedures recommended by sealant and waterproofing manufacturers.

F. Prepare building expansion joints at locations as indicated on drawings.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

D. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

E. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

F. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

G. Seal membrane and flashings to adjoining surfaces. Install termination bar at all edges. Install counterflashing over all exposed edges.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward. Scribe and cut boards around projections, penetrations, and interruptions.

B. Place protection board directly against drainage panel; butt joints. Scribe and cut boards around projections, penetrations, and interruptions.

C. Adhere protection board to substrate with compatible adhesive.

3.05 FIELD QUALITY CONTROL

A. Upon completion of horizontal membrane installation, dam installation area in preparation for flood testing.
   1. Flood to minimum depth of 1 inch with clean water, and after 48 hours inspect for leaks.
   2. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect; repeat flood test, and repair damage to building.
   3. When area is proven watertight, drain water and remove dam.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at cavity wall construction, perimeter foundation wall, underside of floor slabs, over roof deck, over roof sheathing, and exterior wall behind interior wall finish.

B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Field-applied termiticide for concrete slabs and foundations.

C. Section 05 40 00 - Cold-Formed Metal Framing: Board insulation as wall sheathing.

D. Section 06 05 73 - Wood Treatment: Field-applied termiticide for wood.

E. Section 06 10 00 - Rough Carpentry: Supporting construction for batt insulation.

F. Section 06 10 00 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

G. Section 07 21 19 - Foamed-In-Place Insulation: Plastic foam insulation other than boards.

H. Section 07 25 00 - Weather Barriers: Separate air barrier and vapor retarder materials.

I. Section 07 54 00 - Thermoplastic Membrane Roofing: Insulation specified as part of roofing system.

J. Section 07 54 00 - Thermoplastic Membrane Roofing: Installation requirements for board insulation over low slope roof deck specified in this section.

K. Section 07 84 00 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

L. Section 09 21 16 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

D. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2019.

E. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

C. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) carbon black board.

D. Insulation Over Metal Stud Framed Walls, Continuous: Polyiso laminated sheathing board.

E. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

F. Insulation in Wood Framed Ceiling Structure: Batt insulation with separate vapor retarder.

G. Insulation Over Roof Deck: Extruded polystyrene (XPS) board.

2.02 FOAM BOARD INSULATION MATERIALS

A. Termite-Resistant Expanded Polystyrene (EPS) Board Insulation: Complies with ASTM C578.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.

B. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
   5. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   6. Manufacturers:
      a. Kingspan Insulation LLC; GreenGuard XPS Type IV, 25 psi: www.kingspan.com/#sle.
      b. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Extruded Polystyrene (XPS) Cavity Wall Insulation Board: Complies with ASTM C578, and manufactured using carbon black technology.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   5. Board Size: 15-3/4 inch by 96 inch.
   6. Board Thickness: per drawings inch.
   7. Board Edges: Square.

2.03 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.

2. Thickness: 6 inch.
3. Manufacturers:
   a. CertainTeed Corporation; _____: www.certainteed.com/#sle.
   b. Johns Manville; _____: www.jm.com/#sle.
   c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: Specified in Section 07 25 00.

B. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Install boards horizontally on foundation perimeter.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards horizontally on walls.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BOARD INSTALLATION AT CAVITY WALLS

A. Install boards to fit snugly between wall ties.

B. Install boards horizontally on walls.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.05 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.06 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

A. Installation of board insulation over low slope roof deck as specified in Section 07 54 00.

B. Board Installation Over Roof Deck, General:
   1. See applicable roofing specification section for specific board installation requirements.
   2. Fasten insulation to deck in accordance with roofing manufacturer's written instructions.
   3. Do not apply more insulation than can be covered with roofing in same day.

3.07 BOARD INSTALLATION OVER STEEP SLOPE ROOF SHEATHING OR ROOF STRUCTURE

A. Installation of board insulation over steep slope roof structure or roof sheathing is specified in Section 06 10 00.

3.08 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.09 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 21 19

FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in-place insulation.

B. Foamed-in-place intumescent insulation.

C. Foamed-in-place hybrid insulation with intumescent surface layer.

D. Protective intumescent coating.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.

B. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics; 2016.

C. ASTM D1622/D1622M - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2014.

D. ASTM D1623 - Standard Test Method for Tensile And Tensile Adhesion Properties of Rigid Cellular Plastics; 2017.

E. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

H. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

I. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

C. Certificates: Certify that products of this section meet or exceed specified requirements.

D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

1.05 MOCK-UP

A. Locate where directed.

B. Mock-up may remain as part of the Work.

1.06 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Foamed-In-Place Insulation:
   1. BASF Corporation; WALLTITE US Series Closed Cell: www.spf.basf.com/#sle.
   2. Henry Company; _____: www.henry.com/#sle.
   3. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.
   4. NCFI Polyurethanes; _____: www.ncfi.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Monolithic Foamed-In-Place Intumescent Insulation:
   1. Preferred Solutions, Inc; Staycell ONE STEP 255 Spray Foam Insulation: www.stayflex.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

C. Foamed-In-Place Hybrid Insulation System with Intumescent Surface Layer:
   1. Accella Polyurethane Systems; Foamsulate 50: www.accellapolyurethane.com/#sle.
   2. Preferred Solutions, Inc; Staycell 302 / Staycell ONE STEP 255 HYBRID Spray Foam Insulation System: www.stayflex.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Foamed-In-Place Insulation: Low-density, flexible, open celled, water vapor permeable polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Thermal Resistance: R-value of as indicated on drawings, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
   2. Air Permeance: 0.04 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.57 psf.
   3. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   4. Basis of Design:
      a. Icynene-Lapolla; Icynene Classic Plus: www.icynene.com/#sle.
   5. Other Acceptable Manufacturers:
      a. BASF Corporation; ENERTITE NM: www.spf.basf.com/#sle.
      b. Gaco Western; Gaco 052N: www.gaco.com/#sle.
      c. Henry Company; _____: www.henry.com/#sle.
      d. Johns Manville; JM ocSPF Open Cell Spray Polyurethane Foam: www.jm.com/#sle.
      e. Rhino Linings Corporation; ThermalGuard OC.5: www.rhinolinings.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, open or closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
   2. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
   3. Air Permeance: 0.04 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.57 psf.
   4. Closed Cell Content: At least 90 percent.
   5. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   6. Basis of Design:
      a. Icynene-Lapolla; Icynene ProSeal LE: www.icynene.com/#sle.
   7. Other Acceptable Manufacturers:
      a. BASF Corporation; WALLTITE US: www.spf.basf.com/#sle.

b. Henry Company; _____: www.henry.com/#sle.
c. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.

C. Foamed-In-Place Hybrid Insulation System with Intumescent Surface Layer: Hybrid system; foamed on-site using blowing agent of non-ozone-depleting gas.
1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and overcoat limitations.
2. Base Layer: Medium-density, semi-rigid, closed-cell, spray polyurethane foam.
a. Thermal Resistance: R-value of 7.0, minimum, per 1 inch thickness at 140 degrees F mean temperature, at 90 days, when tested in accordance with ASTM C518.
b. Water Vapor Permeance: 0.92 perms, maximum, when tested at 1-1/2 inch thickness in accordance with ASTM E96/E96M.
c. Closed Cell Content: At least 96 percent.
d. Density: 2.0 lbs/cu ft, nominal, in accordance with ASTM D1622/D1622M.
e. Tensile Strength: 58 psi, minimum, in accordance with ASTM D1623.
f. Compressive Strength: 41 psi, minimum, in accordance with ASTM D1621.
g. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, at 4 inch thick when tested in accordance with ASTM E84.
3. Exposed Surface Layer: Medium-density, semi-rigid, two-part, closed cell, intumescent, spray polyurethane foam.
a. Thermal Resistance: R-value of 4.6, minimum, per 1 inch thickness at 140 degrees F mean temperature, at 90 days, when tested in accordance with ASTM C518.
b. Water Vapor Permeance: 0.99 perms, maximum, when tested at 2.4 inch thickness in accordance with ASTM E96/E96M.
c. Air Permeance: Less than 0.0014 cfm/sq ft, when tested at 1-1/4 inch thickness in accordance with ASTM E2178 or ASTM E283 at 1.57 psf.
d. Closed Cell Content: At least 90 percent.
e. Density: 2.0 lbs/cu ft, nominal, in accordance with ASTM D1622/D1622M.
f. Tensile Strength: 28 psi, minimum, in accordance with ASTM D1623.
g. Compressive Strength: 22 psi, minimum, in accordance with ASTM D1621.
h. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, at 4 inch thick when tested in accordance with ASTM E84.
4. Manufacturers:
a. Preferred Solutions, Inc; Staycell 302 / Staycell ONE STEP 255 HYBRID Spray Foam Insulation System: www.stayflex.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Protective Coating: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete prior to insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Apply to achieve a thermal resistance R-value of as indicated on drawings.

D. Apply overcoat monolithically, without voids to fully cover foam insulation, to achieve fire rating required.

E. Patch damaged areas.

F. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

G. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 FIELD QUALITY CONTROL

A. Field inspections and tests will be performed by an independent testing agency under provisions of Section 01 40 00 - Quality Requirements.

B. Inspection will include verification of insulation and overcoat thickness and density.

3.05 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 21 29
SPRAYED ACOUSTICAL INSULATION

PART 1 – GENERAL

1.01 Section Includes

A. Sprayed cellulose thermal insulation.
B. Sprayed cellulose acoustical insulation.

1.02 Related Items

A. Clips, hangers, supports, sleeves and other attachments to spray bases are to be placed by other trades prior to the application of sprayed insulation.
B. Ducts, piping, conduit or other suspended equipment shall not be positioned until after the application of sprayed insulation.
C. Roof penetrations to be installed prior to application.

1.03 Quality Assurance

A. Manufacturer must have a current Underwriters Laboratories (UL) Code Evaluation Report.
B. Manufacturer must be in compliance with the 2009 and 2012 International Building Code.
C. Manufacturer must be ISO 9001:2015 Certified.
D. Applicator: Licensed by manufacturer.
E. Manufacturer must subscribe to independent laboratory follow-up inspection services of Underwriters Laboratories and Factory Mutual. Each bag shall be labeled accordingly.
F. Mock-up: Apply a 100 square foot representative sample to be reviewed by the Architect and/or Owner prior to proceeding.

1.04 Submittals

A. Submit product data that the product meets or exceeds the following specified requirements.
   1. Bond strength shall be greater than 100 psf per ASTM E 736.
   2. Product shall be Class 1 Class A per ASTM E 84/ UL 723.
   3. Non-corrosive per ASTM C 739.
   4. Bond Deflection per ASTM E 759: 6” Deflection in 10’ Span – No Spalling or Delamination.
   5. R-Value to be 3.75 per inch per ASTM C 518.
   6. Comply with 2009 IBC Section 803.10 stability requirements for interior finishes.
   7. Meet ASTM C 1149
B. Manufacturer's written certification that product contains no asbestos, fiberglass or other man-made mineral fibers.
C. Copy of manufacturer’s ISO 9001:2015 Certification.
D. Minimum Fiber Recycled Content to be 75%.
E. Cannot contain any added Urea-Formaldehyde Resins.

1.06 Delivery, Storage and Handling

A. Deliver in original, unopened containers bearing name of manufacturer, product identification and reference to U.L. testing.
B. Store materials dry, off ground, and under cover.
C. Protect liquid adhesive from freezing.
D. Water to be potable.

PART 2 – PRODUCTS

2.01 Acceptable Manufacturers

A. International Cellulose Corporation
12315 Robin Boulevard
Houston, Texas 77045
(713) 433-6701 or (800) 444-1252
FAX: (713) 433-2029
www.spray-on.com icc@spray-on.com

B. For approved applicators contact ICC at 800-444-1252.

2.02 Materials

A. K-13 Spray-On-Systems.
   1. Color shall be from Manufacturer's standard color chart.
   2. Comply with local Building Code requirements.
   3. Material to have been tested in accordance with ASTM E 1042. Testing laboratory must be NVLAP accredited.

PART 3 – EXECUTION

3.01 Examination

A. Examine surfaces and report unsatisfactory conditions in writing. Do not proceed until unsatisfactory conditions are corrected.

B. Verify surfaces to receive spray insulation to determine if priming/sealing is required to insure bonding and/or to prevent discoloration caused by migratory stains.

3.02 Preparation

A. Provide masking, drop cloths or other satisfactory coverings for materials/surfaces that are not to receive insulation to protect from over-spray.

B. Coordinate installation of the sprayed cellulose fiber with work of other trades.

C. Prime surfaces as required by manufacturer's instructions or as determined by examination.

3.03 Installation

A. Install spray applied insulation according to manufacturer's recommendations.

B. Install spray applied insulation to achieve an average R-Value as shown on drawings.

C. Install spray applied insulation to achieve an average NRC as shown on drawings

K-13 Sprayed Thermal and Acoustical Insulation ASTM C-423 on Solid Backing							
Inches	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	NRC
1"	0.11	0.32	0.84	0.99	1.01	0.98	0.80
1.75"	0.30	0.74	1.14	1.06	0.99	0.98	1.00
2"	0.47	0.90	1.06	1.06	1.08	1.07	1.00
3"	0.57	0.99	1.04	1.03	1.00	0.98	1.00
4"	0.84	1.06	1.01	1.03	1.00	0.98	1.05
5"	0.99	0.89	1.05	1.03	1.00	1.00	1.00

K-13 Sprayed Thermal and Acoustical Insulation Applied on 1.5" Metal Deck							
Inches	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	NRC
1.50	0.36	0.89	1.26	1.07	1.01	1.00	1.05
3.00	0.97	1.04	1.13	0.99	0.95	0.98	1.05

D. Cure insulation with continuous natural or mechanical ventilation.

E. Remove and dispose of over-spray.

F

3.04 Protection

A. Protect finished installation under provision of Division 1.

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

B. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls water vapor resistant and air tight.

C. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, joints around frames of openings in exterior walls, and ____.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.

B. Section 07 24 00 - Exterior Insulation and Finish Systems: Water-resistive barrier under exterior insulation.

C. Section 07 54 00 - Thermoplastic Membrane Roofing: Vapor retarder installed as part of roofing system.

D. Section 07 92 00 - Joint Sealants: Sealing building expansion joints.

E. Section 09 21 16 - Gypsum Board Assemblies: Water-resistive barrier under exterior cladding.

1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
   1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Manufacturer's Installation Instructions: Indicate preparation.

1.05 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.

B. Exterior Vapor Retarder:
   1. On outside surface of inside wythe of masonry cavity wall use vapor retarder coating.
   2. On outside surface of sheathing use vapor retarder coating.
   3. On under side of elevated floors over enclosed soffit space use vapor retarder coating.

2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)

2.03 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
   1. Air Barrier Coating:
      a. Material: Acrylic.
      b. Acceptable Substrates: Stated by manufacturer as uitable for installation on visibly damp surfaces and concrete that has hardened but is not full cured ("green" concrete) without requireing a primer.
      c. Adhesion to Paper and Glass Mat Faced Sheathing: Sufficient to ensure failure due to delamination of sheathing.
      d. Dry Film Thickness (DFT): 10 mil, 0.010 inch, minimum.
      e. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
      f. Water Vapor Permeance: 18 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure B (Water Method) at 73.4 degrees F.
      g. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to six months of weather exposure after application.
      h. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
      i. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
      j. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
      k. Manufacturers:
         1) 3M Company; ____: www.3M.com/construction/#sle.
         2) Master Wall, Inc; Rollershield LAB System: www.masterwall.com/#sle.
         3) Parex USA, Inc; Parex USA WeatherSeal Spray & Roll-on: www.parexusa.com/#sle.
         4) PROSOCO, Inc; R-GUARD Spray Wrap MVP: www.prosoco.com/r-guard/#sle.
         5) Substitutions: See Section 01 60 00 - Product Requirements.

2.04 AIR BARRIER MATERIALS (AIR AND VAPOR BARRIER)

A. Air and Vapor Barrier Sheet, Fluid-Applied:
   1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
   3. Water Penetration Resistance Around Nails: Pass, when tested in accordance with ASTM D1970/D1970M.
   4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
   5. Seam and Perimeter Tape: As recommended by sheet manufacturer.
   6. Manufacturers:
      a. Carlisle Coatings and Waterproofing, Inc; Fire Resist Barritech NP: www.carlisleccw.com/#sle.
      b. Tremco Commercial Sealants & Waterproofing; ExoAir 130: www.tremcosealants.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)

2.06 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

E. Mechanically Fastened Sheets - On Exterior:
   1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
   2. Overlap seams as recommended by manufacturer but at least 6 inches.
   3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
   4. Install air barrier and vapor retarder underneath the jamb flashings.
   5. Install head flashings under weather barrier.
   6. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

F. Coatings:
   1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
   2. Use flashing to seal to adjacent construction and to bridge joints.

G. Openings and Penetrations in Exterior Weather Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
   3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
   4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
   5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 27 20
VAPOR-PERMEABLE, FLUID-APPLIED MEMBRANE AIR BARRIERS

PART I GENERAL

1.01 SCOPE:

A. Furnish all materials, equipment, labor and supervision necessary to provide and install vapor permeable, fluid-applied membrane air barriers (infiltration barriers).

1.02 RELATED DOCUMENTS:

A. Applicable provisions of the General Conditions, Supplementary Conditions and Division 1, General Requirements, apply to the work under this section.

Section 07 62 00 Flashing and Sheet Metal
Section 07 92 00 Sealants and Caulking

1.03 SUMMARY

A. This Section includes the following:

1. Materials and installation methods for fluid applied, vapor permeable air barrier membrane system located in the non-accessible part of the wall.
2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.

1.04 DEFINITIONS:

A. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.05 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Commonwealth of Massachusetts Building Code Requirements: The intent of this specification is to require compliance with 780 CMR 13, Section 1304.3 Air Leakage.

1.06 AIR BARRIERS:

A. The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. An air barrier shall also be provided for interior partitions between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50% of the difference between the conditioned space and design ambient conditions. The air barrier shall have the following characteristics:

1. It must be continuous, with all joints made airtight.
2. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water. (1.57 psf.) (equal to 0.02L/sq. m @ 75 Pa.).
3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
4. It shall be durable or maintainable.

5. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
   a. Foundation and walls.
   b. Walls and windows or doors.
   c. Different wall systems.
   d. Wall and roof.
   e. Wall and roof over unconditioned space.
   f. Walls, floor and roof across construction, control and expansion joints.
   g. Walls, floors and roof to utility, pipe and duct penetrations.
6. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made air-tight.

1.07 REFERENCES:

A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.

B. American Society for Testing and Materials (ASTM)
   1. C920 Specifications for Elastomeric Joint Sealants
   2. C1193 Guide for Use of Joint Sealants
   3. D412 Standard Test Methods for Rubber Properties in Tension
   4. D570 Test Method for Water Absorption of Plastics
   5. D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
   6. D1876 Test Method for Peel Resistance of Adhesives
   7. D1938 Test Method for Tear Propagation Resistance of Plastic Film and Sheeting
   8. D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
   9. D4258 Practice for Surface Cleaning Concrete for Coating
   10. D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
   11. E96 Test Methods for Water Vapor Transmission of Materials
   12. E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
   13. E162 Test Method for Surface Flammability of Materials Using a Radiant Heat Source
   14. E1186 Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems
   15. E2178-01 Standard Test Method for Air Permeance of Building Materials

1.08 SUBMITTALS:

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

   1. Include details of interfaces with other materials that form part of air barrier.
   2. Include details of mockups.

C. Samples: Submit representative samples of the following for approval:
   1. Fluid applied membrane
   2. Transition tape
   3. Through Wall Flashing

D. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

E. Qualification Data: For Applicator.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.

G. Warranty: Submit a sample warranty identifying the terms and conditions stated in Article 1.10.

1.09 QUALITY ASSURANCE:

A. Manufacturer: Air barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of waterproofing. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.

B. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

C. Mockups: Before beginning installation of air barrier, provide air barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.

1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.
2. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Preinstallation conference shall include the Contractor, installer, Architect, and system manufacturer's field representative. Agenda for meeting shall include but not be limited to the following:

1. Review of submittals.
2. Review of surface preparation, minimum curing period and installation procedures.
3. Review of special details and flashings.
4. Sequence of construction, responsibilities and schedule for subsequent operations.
5. Review of mock-up requirements.
6. Review of inspection, testing, protection and repair procedures.

1.10 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer’s instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

B. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.

C. Protect fluid-applied membrane components from freezing and extreme heat.

D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.11 PROJECT CONDITIONS:

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a wet substrate or during snow, rain, fog, or mist.

1.12 WARRANTY:

A. Material Warranty: Manufacturer's standard form in which manufacturer agrees to replace fluid-applied air barrier membrane materials, that fail within specified warranty period when installed and used in strict conformance with written manufacturer's instructions.
   1. Failures include, but are not limited to, the following:
      a. Failure to maintain air permeance rating not to exceed 0.02 L/s/sq. m. when tested per ASTM E2178, within specified warranty period.
      b. Failure to maintain a vapor permeance rating greater than 10 perms when tested in accordance with ATM E96, Method B.
   2. Warranty Period: Five years from date of Substantial Completion.

PART II PRODUCTS

2.01 FLUID-APPLIED, VAPOR PERMEABLE MEMBRANE AIR BARRIER:

A. Single-Component Acrylic, Fluid-Applied, Vapor-Permeable Membrane Air Barrier subject to compliance with requirements, provide the following:

   1. Perm-A-Barrier VP as manufactured by Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA.
   2. Air-Shield LMP as manufactured by W. R. Meadows, Inc. P.O. Box 338 Hampshire, IL 60140
   3. Additional alternate products must be approved by Architect prior to bidding.

B. Physical and Performance Properties: Provide products with the following minimum properties:
   1. Membrane Air Permeance: Not to exceed 0.004 cfm/sq. ft. of surface area (at specified thickness) at 1.57-lbf/sq. ft. pressure difference (0.002 L/s x sq. m of surface area at 75-Pa) when applied to CMU wall; when tested per ASTM E2178.
   2. Membrane Vapor Permeance: Not less than 11.2 perms (649.6 ng/Pa x s x sq. m); when tested per ASTM E96.
   3. UV Exposure Limit: Not more than 150 calendar days; per ASTM D412 and ASTM E96-Method B.

2.02 AUXILIARY MATERIALS:

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Liquid Membrane for Details and Terminations: Provide Bituthene Liquid Membrane as manufactured by Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA.

C. Wall Primer (for Use with Throughwall Flashing and Tapes Applied to Substrate): Liquid water-borne primer recommended for substrate by manufacturer of air barrier material.
   1. Flash Point: No flash to boiling point
   2. Solvent Type: Water
   3. VOC Content: Not to exceed 10 g/l
   4. Application Temperature: -4°C (25°F) and above
   5. Freezing point (as packaged): -7°C (21°F)
   6. Product: Perm-A-Barrier WB Primer manufactured by Grace Construction Products.

D. Flexible Membrane Wall Flashing: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
   1. Water Vapor Transmission: ASTM E96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
   2. Water Absorption: ASTM D570: max. 0.1% by weight
   3. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.
   4. Tear Resistance

a. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.
b. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.

5. Lap Adhesion at -4ºC (25ºF): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
6. Low Temperature Flexibility ASTM D1970: Unaffected to -43ºC (-45ºF)
7. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)
8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%.
9. Product: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products.

E. Joint Reinforcing Strip: Air barrier manufacturer's approved tape.

F. Transition Tape: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

1. Water Vapor Transmission: ASTM E96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
2. Water Absorption: ASTM D570: max. 0.1% by weight
3. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.
4. Tear Resistance
   a. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.
   b. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.

5. Lap Adhesion at -4ºC (25ºF): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
6. Low Temperature Flexibility ASTM D1970: Unaffected to -43ºC (-45ºF)
7. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)
8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%.
9. Product: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products.

G. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

1. Product: Bituthene Liquid Membrane, manufactured by Grace Construction Products.

H. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft (24 to 32 kg/cu. m) density; flame spread index of 25 or less according to ASTM E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

I. Joint Sealant: ASTM C920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O.

PART III EXECUTION

3.01 EXAMINATION:

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
4. Verify that masonry joints are struck flush and completely filled with mortar.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION:

A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier system.

B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with 50 - 75mm (2-3 in.) wide, manufacturer's recommended self-adhesive tape. Gaps greater than 6mm (1/4 in.) should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the tape and fluid applied air barrier system.

C. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth trowel-cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.

D. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

E. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

F. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

G. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

H. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

I. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

J. At changes in substrate plane, apply sealant or Bituthene Liquid Membrane at sharp corners and edges to form a smooth transition from one plane to another.

K. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT:

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D4258 before coating surfaces

1. Prime substrate as required.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C1193 and with air barrier manufacturer's written instructions. Apply tape to joint prior to installing fluid air barrier membrane.

3.04 AIR BARRIER MEMBRANE INSTALLATION:

A. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.

1. Vapor-Permeable Membrane Air Barrier: 90-mil (2.4-mm) wet film thickness, 45-mil (1.2-mm) dry film thickness.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.05 TRANSITION STRIP INSTALLATION:

A. Install strips, transition strips, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
   1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
   2. Install strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.
   3. Install all flashings only after application of air barrier.

B. Apply primer to substrates to receive transition tapes at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Reprime areas exposed for more than 24 hours.
   1. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.
   1. Transition Strip: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.06 FIELD QUALITY CONTROL:

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
   1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Continuous structural support of air barrier system has been provided.
   3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
   4. Site conditions for application temperature and dryness of substrates have been maintained.
   5. Maximum exposure time of materials to UV deterioration has not been exceeded.
   6. Surfaces have been primed, if applicable.
   7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
   8. Termination mastic has been applied on cut edges.
   9. Strips and transition strips have been firmly adhered to substrate.
   10. Compatible materials have been used.
   11. Transitions at changes in direction and structural support at gaps have been provided.

12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:
1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, smoke pencil with pressurization or depressurization.

D. Remove and replace deficient air barrier components and retest as specified above.

3.07 CLEANING AND PROTECTION:

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 150 days.

C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Remove masking materials after installation.

END OF SECTION

SECTION 07 31 13
ASPHALT SHINGLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphalt shingle roofing.

B. Flexible sheet membranes for eave protection, underlayment, and valley protection.

C. Associated metal flashings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Roof sheathing.

B. Section 06 15 00 - Wood Decking: Roof decking.

C. Section 07 21 00 - Thermal Insulation: Nailable rigid insulation.

D. Section 07 62 00 - Sheet Metal Flashing and Trim: Edge and cap flashings.

E. Section 07 71 23 - Manufactured Gutters and Downspouts.

F. Section 07 72 00 - Roof Accessories: Snow guards.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating material characteristics.

C. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color selection.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in KCDC's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Shingles: 100 sq ft of each type and color.

1.04 FIELD CONDITIONS

A. Do not install shingles or eave protection membrane when surface temperatures are below 45 degrees F.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Algae Resistant Asphalt Shingles:
   1. Atlas Roofing Corporation; Storm Master Shake High Wind and Impact Resistant Shingles: www.atlasroofing.com/#sle.
   2. GAF; Timberline Ultra HD Shingles with StainGuard Plus: www.gaf.com/#sle.
   3. IKO Industries Inc; Dynasty with ArmourZone: www.iko.com/#sle.
   4. Owens Corning Corp; ____: www.owenscorning.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ASPHALT SHINGLES

A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
   1. Wind Resistance: Class F, when tested in accordance with ASTM D3161/D3161M.
   2. Warranted Wind Speed: Not less than tested wind resistance.
   3. Algae Resistant.

4. Weight: 425 lb/100 sq ft.
5. Self-sealing type.
6. Color: As selected by Architect.

2.03 SHEET MATERIALS

A. Eave Protection Membrane:
   1. Eave Protection Membrane: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.
   2. Manufacturers:
      a. Grace; Ice & Water Shield.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Underlayment: Self-adhering rubber-modified asphalt sheet complying with ASTM D1970/D1970M; 22 mil total thickness; with strippable release film and woven polypropylene sheet top surface.
   1. Minimum Requirements: Comply with requirements of ICC-ES AC188 for non-self-adhesive sheet.
   2. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
   3. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
   4. Manufacturers:
      a. System Components Corporation, Inc; FelTex SA300: www.systemcomponents.net/#sle.
      b. Grace; Select: www.grace.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails, or copper roofing nails, minimum 3/8 inch head diameter, 12 gage, 0.109 inch nail shank diameter, 1-1/2 inch long and complying with ASTM F1667.

B. Nails: Standard round wire shingle type, of hot-dipped zinc coated steel, 10 wire gage, 0.1019 inch shank diameter, 3/8 inch head diemeter, of sufficient length to penetrate through roof sheathing or 3/4 inch into roof sheathing or decking.

C. Plastic Ridge Vents: Extruded plastic with vent openings that do not permit direct water or weather entry; flanged to receive shingles.

2.05 METAL FLASHINGS

A. Metal Flashings: Provide sheet metal eave edge, gable edge, ridge, ridge vents, open valley flashing, chimney flashing, dormer flashing, and other flashing indicated.
   1. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
   2. Hem exposed edges of flashings minimum 1/4 inch on underside.
   3. Coat concealed surfaces of flashings with bituminous paint.

B. Sheet Metal: Galvanized steel, as specified in Section 07 62 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that roof deck is of sufficient thickness to accept fasteners.

C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

D. Verify roof openings are correctly framed.

E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

A. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.

B. Broom clean deck surfaces before installing underlayment or eave protection.

C. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with plastic cement, and secure flange with nails spaced 12 inches on center.

3.03 INSTALLATION - EAVE PROTECTION MEMBRANE

A. Install eave protection membrane from eave edge to minimum 4 ft up-slope beyond interior face of exterior wall.

B. Install eave protection membrane in accordance with manufacturer's instructions.

3.04 INSTALLATION - UNDERLAYMENT

A. Underlayment At Roof Slopes Up to 4:12: Install two layers of underlayment over area not protected by eave protection, with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer, and nail in place.

B. Underlayment At Roof Slopes Greater Than 4:12: Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer, nail in place, and weather lap minimum 4 inches over eave protection.

C. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.

3.05 INSTALLATION - VALLEY PROTECTION

A. Install flexible flashing in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Weather lap joints minimum 2 inches.

C. Nail in place minimum 18 inches on center, 1 inch from edges.

D. At Exposed Valleys: Install one layer of sheet metal flashing, minimum 24 inches wide, centered over open valley and crimped to guide water flow, weather lap joints minimum 2 inch wide band of lap cement along each edge of first layer, press roll roofing into cement, nail in place minimum 18 inches on center and 1 inch from edges.

E. At Exposed Valleys: Install minimum 36 inches wide roll roofing with mineral surface side up over first layer of protection, and centered, apply 4 inch wide band of lap cement along each edge of first layer, press roll roofing into cement, nail in place minimum 18 inches on center and 1 inch from edges.

3.06 INSTALLATION - METAL FLASHING AND ACCESSORIES

A. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.

B. Secure in place with nails at 12 inches on center, and conceal fastenings.

C. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

3.07 INSTALLATION - SHINGLES

A. Install shingles in accordance with manufacturer's instructions manufacturer's instructions.
   1. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
   2. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.

B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.

C. Project first course of shingles 3/4 inch beyond fascia boards.

D. Extend shingles 1/2 inch beyond face of gable edge fascia boards.

E. Complete installation to provide weather tight service.

3.08 PROTECTION

A. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07 42 13

METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels and soffit panels, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 05 40 00 - Cold-Formed Metal Framing: Water-resistive barrier under wall panels.

C. Section 06 10 00 - Rough Carpentry: Wall panel substrate.

D. Section 06 10 00 - Rough Carpentry: Water-resistive barrier under wall panels.

E. Section 07 21 00 - Thermal Insulation.

F. Section 07 25 00 - Weather Barriers: Weather barrier under wall panels.

G. Section 07 92 00 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

H. Section 09 21 16 - Gypsum Board Assemblies: Wall panel substrate.

I. Section 09 21 16 - Gypsum Board Assemblies: Water-resistive barrier under wall panels.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, _____, and methods of anchorage.

C. Samples: Submit two samples of wall panel and soffit panel, 12 inch by 12 inch in size illustrating finish color, sheen, and texture.

D. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in KCDC's name and registered with installer.

1.04 MOCK-UP

A. Construct mock-up, 4 feet long by 4 feet wide; include panel and soffit system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, related insulation, and abutting differ wall finish veneer types in mock-up.

B. Locate where directed by Architect.

C. Mock-up may remain as part of the Work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

C. Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for metal wall panels.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:

B. Wall Panels, as shown on drawings for Building 1 to be: Longboard Inspiring Facades; Longboard Products.com

C. Alpolic Meal Composite Metals; https://www.alpolic-americas.com/products Used on Building 1

D. Wall panels, as shown on drawings for Building 2-9 to be: Mac Metal Architectural; Wood Collection. Used on Buildings 2-9

E. Refer to drawings for panel sizes, finish type, and color for metal wall panels and soffits.

F. Metal Wall Panels - Concealed Fasteners:
   1. Longboard Inspiring Facades; Longboard Products.com Used on Building 1.
   2. Alpolic Meal Composite Metals; https://www.alpolic-americas.com/products Used on Building 1
   3. Mac Metal Architectural; Wood Collection. Used on Buildings 2-9

G. Metal Soffit Panels:
   1. Mac Metal Architectural; Wood Collection. Used on Buildings 2-9.

2.02 MANUFACTURED METAL PANELS

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior wall panels and soffit panels.
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   7. Corners: Factory-fabricated in one continuous piece with minimum 2 inch returns.
   8. Provide continuity of air barrier and vapor retarder seal at building enclosure elements in accordance with materials specified in Section 07 25 00.

B. Exterior Wall Panels:
   1. Profile: As indicated on drawings.
   2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
   3. Panel Width: per drawings inches.
   4. Color: As indicated on drawings.

C. Soffit Panels:
   1. Profile: Style as indicated.
   2. Color: As indicated on drawings.

D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

E. Expansion Joints: Same material, thickness and finish as exterior sheets; ___ gage, ___ inch thick; manufacturer's standard brake formed type, of profile to suit system.

F. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

G. Anchors: Galvanized steel.

2.03 ACCESSORIES

A. Concealed Sealants: Non-curing butyl sealant or tape sealant.

B. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.

C. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify that water-resistive barrier has been installed over substrate completely and correctly.

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at intervals indicated per manufacturer's recommendation.

3.03 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Lap panel ends minimum 2 inches.

F. Use concealed fasteners unless otherwise approved by Architect.

G. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

D. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 07 46 16
ALUMINUM SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum siding for exterior walls.

B. Trim, flashings, accessories, and fasteners for aluminum siding.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings and trim associated with metal siding.

C. Section 07 92 00 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

A. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2016.

B. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007 (Reapproved 2015).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate layout, methods of attachment, provisions for movement, flashing, trim, edge and field conditions, interface with adjacent materials, locations of cutouts or special shapes, and details.

C. Samples: For each finish product specified, provide two complete sets of color chips representing manufacturer's full range of available colors and patterns, including the following:
   1. Siding: Two of each type; full panel width by 12 inches long.
   2. Fasteners and Accessories: Two of each type; full size, and indicate use.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in KCDC's name and registered with manufacturer.

1.05 MOCK UP

A. Construct mock-up, [4] feet long by [4] feet wide; include panel and soffit system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, related insulation, and [abutting differ wall finish veneer types] in mock-up.

B. Locate where directed by Architect.

C. Mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing brand name and manufacturer's identification until ready for installation.

B. Verify quantities and condition immediately upon receipt; remove damaged materials from site, and coordinate with manufacturer to replace with new materials meeting specified requirements.

C. Store products off the ground, within manufacturer's temperature and environmental limits, away from moisture, protected from traffic and construction activities, and minimize on-site storage prior to installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Manufacturer's Warranty: Provide manufacturer's standard lifetime, non-prorated, transferable warranty, including 20 year hail protection warranty.

D. Manufacturer's warranty on siding and trim accessories finishes to cover the following:
   1. Color fading of not more than five Hunter color-difference units when tested in accordance with ASTM D2244.
   2. Degree of chalking of eight or greater when tested in accordance with ASTM D4214.
   3. Cracking, checking, peeling, or failure of paint to adhere to metal substrate.
   4. Warranty Period: Based on specific finish system.
      a. SMP (Silicone-Modified Polyester): 15 years.
      b. PVDF (Polyvinylidene Fluoride): 15 years.
      c. PVC (Plastisol): 10 years.
      d. Acrylic: 10 years.
      e. Polyester: 10 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum Siding:
   1. Longboard Inspiring Facades; Longboard Products.com Used on Building 1.
   2. Alpolic Meal Composite Metals; https://www.alpolic-americas.com/products Used on Building 1
   3. Mac Metal Architectural; Wood Collection. Used on Buildings 2-9

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate conditions before beginning installation.

B. Verify dimensions and acceptable substrate condition.

C. Verify weather resistant barrier (WRB) has been properly installed over substrate; refer to Section 07 25 00 for requirements.

D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

E. Do not proceed with installation until unacceptable conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Prepare surfaces as recommended by manufacturer.

3.03 INSTALLATION

A. Install aluminum siding, soffit, trim, and accessories in accordance with manufacturer's written instructions.

B. Attach siding using manufacturers recommended fasteners, sealants, and adhesives, allowing for thermal expansion.

C. Provide concealed fasteners except where approved on shop drawings.

D. Exterior Soffit Vents: Install according to manufacturer's written instructions; provide vent area specified.

E. Install joint sealants as specified in Section 07 92 00 for a watertight installation.

F. Where dissimilar materials are in contact, prevent galvanic action as recommended by manufacturer.

3.04 CLEANING

A. Remove grease and oil films, excess joint sealer, handling marks, and other installation debris from aluminum siding, leaving siding clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to material finishes.

B. Remove excess materials and debris from project site.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 46 46

FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Siding substrate.

B. Section 05 40 00 - Cold-Formed Metal Framing: Water-resistive barrier under siding.

C. Section 06 10 00 - Rough Carpentry: Siding substrate.

D. Section 06 10 00 - Rough Carpentry: Water-resistive barrier under siding.

E. Section 07 25 00 - Weather Barriers: Weather barrier under siding.

F. Section 07 92 00 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

G. Section 09 91 13 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2016).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.

C. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.

D. Warranty: Submit copy of manufacturer’s warranty, made out in KCDC’s name, showing that it has been registered with manufacturer.

E. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in KCDC's name and registered with installer.

1.05 MOCK UP

A. Construct mock-up, [4] feet long by [4] feet wide; include panel and soffit system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, related insulation, and [abutting differ wall finish veneer types] in mock-up.

B. Locate where directed by Architect.

C. Mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products under waterproof cover and elevated above grade, on a flat surface.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Installation Warranty for Building Rainscreen Assembly: Installer of exterior rainscreen assembly (including air/vapor barrier and attachments, framing, and exterior panels) to provide

10-year warranty that includes coverage for defective materials and/or workmanship. This warranty will also clearly include materials, labor, necessary activity to access these areas, and removal of any materials to effect repairs and restore to watertight conditions. www.edacontractors.com/#sle

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Style: as indicated on drawings.
   2. Texture: Smooth.
   3. Width (Height): as indicated on drawings inches.
   4. Thickness: 5/16 inch, nominal.
   5. Finish: Factory applied primer.
   6. Color: As indicated on drawings.
   7. Warranty: 30 year limited; transferable.
   8. Manufacturers:
      a. Allura, a division of Plycem USA, Inc; _____: www.allurausa.com/#sle.
      b. James Hardie Building Products, Inc; _____: www.jameshardie.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Panel Siding: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Texture: Smooth.
   2. Length (Height): random, as indicated on drawings inches, nominal.
   3. Width: random, as indicated on drawings inches.
   4. Finish: Factory applied stain.
   5. Color: As indicated on drawings.
   6. Warranty: 30 year limited; transferable.
   7. Manufacturers:
      a. Equitone Fiber Cement Facade Materials; https://www.equitone.com/.
      b. Swiss Pearl Facad Panels; https://www.swisspearl.com/

C. Soffit Panels: Smooth panels of same material and finish.

2.02 ACCESSORIES

A. Furring Strips: Galvanized metal channels.

B. Trim: Same material and texture as siding.

C. Fasteners: Eco-cladding brackets; http://www.ecocladding.com/alpha-v-bracket-vertical

D. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.

E. Finish Paint: Latex house paint acceptable to siding manufacturer; primer recommended by paint manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that water-resistive barrier has been installed over substrate completely and correctly.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Install Sheet Metal Flashing:
   1. Above door and window trim and casings.
   2. Above horizontal trim in field of siding.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.
   1. Read warranty and comply with terms necessary to maintain warranty coverage.
   2. Use trim details indicated on drawings.
   3. Touch up field cut edges before installing.
   4. Pre-drill nail holes if necessary to prevent breakage.

B. Simulated Masonry Panels: Install with manufacturer's recommended clips leaving no fasteners visible.

C. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.

D. Over Masonry Walls: Install furring strips of adequate thickness to accept full length of nails and spaced at 16 inches on center; leave space at top and bottom open; top may be behind soffit; at bottom install insect screen over opening by wrapping a strip of screen over bottom ends of vertical furring strips.

E. Over Steel Studs: Use hot-dipped galvanized self-tapping screws, with the points of at least three screws penetrating each stud the panel crosses and at panel ends.

F. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.

G. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.

H. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.

I. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

J. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings, and provide vent area specified.

K. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

L. Finish Painting: Within one week after installation, paint siding and trim with one coat primer and two coats finish paint.

3.04 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 54 00
FULLY ADHERED THERMOPLASTIC MEMBRANE ROOFING

PART I GENERAL

1.01 SCOPE:

A. Furnish and install a fully adhered thermoplastic membrane roofing system where shown on the drawings, including insulation, wood grounds, and wood cleats required to secure roofing in place and miscellaneous items as necessary for a complete warranted installation.

1.02 RELATED DOCUMENTS:

A. Applicable provisions of the General Conditions, Supplementary Conditions and Division 1, General Requirements, apply to the work under this section.

Section	05 31 00	Steel Roof Deck
Section	06 63 30	Roof Guard Protection System
Section	06 10 00	Rough Carpentry
Section	06 15 00	Wood Decking
Section	06 17 33	Wood I-Joists
Section	06 28 63	Shop Fabricated Wood Trusses
Section	07 62 00	Flashing and Sheet Metal
Section	07 72 00	Roofing Accessories

1.03 DEFINITIONS:

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.04 PERFORMANCE REQUIREMENTS:

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: Class 1A-60
2. Hail Resistance: MH

1.05 SUBMITTALS:

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
   a. Insulation fastening patterns.

C. Samples for Verification: For the following products:

1. 12-by-12-inch (300-by-300-mm) square of sheet roofing, of color specified, including T-shaped side and end lap seam.
2. 12-by-12-inch (300-by-300-mm) square of roof insulation.
3. 12-by-12-inch (300-by-300-mm) square of walkway pads or rolls.
    a. 12-inch (300-mm) length of metal termination bars.
    b. 12-inch (300-mm) length of battens.
    c. Six insulation fasteners of each type, length, and finish.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

F. Qualification Data: For Installer and manufacturer.
G. Maintenance Data: For roofing system to include in maintenance manuals.
H. Warranties: Provide sample copies of standard and special warranties specified in this Section.
I. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.
J. Certification of Manufacturer’s warranty reserve.

1.06 QUALITY ASSURANCE:

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
B. Manufacturer Qualifications: A qualified manufacturer that has UL listing for membrane roofing system identical to that used for this Project.
C. Source Limitations: Obtain components for membrane roofing system from or approved by roofing membrane manufacturer.
D. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A ASTM E 108, for application and roof slopes indicated.
2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.

E. Pre-installation Conference: Contractor must have approved shop drawings prior to scheduling pre-installation conference. Conduct conference at Project site. Notify attendees not less than 10 days prior to scheduled meeting date Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner, Architect, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Introduce Contractor’s proposed foreman and provide contact information. Once the work begins, Contractor shall not change foreman during the course of the work. Foreman shall be on the job site at all times while work is in progress.
3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
6. Review structural loading limitations of roof deck during and after roofing.
7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
8. Review governing regulations and requirements for manufacturer's certificates if applicable.
9. Review temporary protection requirements for roofing system during and after installation.
10. Review roof observation and repair procedures after roofing installation.

1.07 DELIVERY, STORAGE, AND HANDLING:

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components. Deliver in sufficient quantity to permit work to continue without interruption.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. If exposed to lower temperature, restore to manufacturer's recommended application temperature before using. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.08 PROJECT CONDITIONS:

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements. Do not exceed temperature limitations recommended by roofing manufacturer.

B. Proceed with work so new roofing materials are not subject to construction traffic to the greatest extent possible. When necessary, protect new roof sections and inspect for damage upon completion.

C. Provide protection, such as ¾" plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters.

D. New roofing shall be complete and weathertight at the end of each work day.

1.09 JOBSITE PROTECTION:

A. The roofing contractor shall adequately protect building, paved areas, service drives, lawn, shrubs, trees, etc. from damage while performing the required work. Provide canvas, boards and sheet metal (properly secured) as necessary for protection and remove protection material at completion. The Contractor shall repair or be responsible for costs to repair all property damaged during the roofing application.

B. Do not overload any portion of the building, either by use of or placement of equipment, storage of debris, or storage of materials.

C. Protect against flame spread. Maintain proper and adequate fire extinguishers.

D. Take precautions to prevent drains from clogging during the roofing application. Remove debris at the completion of each day's work and clean drains if required. At completion, test drains to ensure the system is free running and drains are water-tight. Remove strainers and plug drains in areas where work is in progress. Install flags or other telltales on plugs. Remove plugs each night and screen drain.

1.10 SAFETY:

A. The roofing contractor shall be responsible for all means and methods as they relate to safety and shall comply with all applicable local, state and federal requirements that are safety related. All related personnel shall be instructed daily to be mindful of the full time requirement to maintain a safe environment for the other personnel on the job site.

1.11 WORKMANSHIP:

A. Applicators installing new roof, flashing, sheet metal, and related work shall be factory trained and approved by the manufacturer they are representing.

B. All work shall be of the highest quality and in strict accordance with the manufacturer's published specifications and to the building owner's satisfaction.

C. Contractor's selected foreman shall be on the job site at all times while work is in progress.

D. Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified including operation of hot air welding equipment and power supply.

E. There shall be no deviations made from this specification or the approved shop drawings without the prior approval of the specifier. Any deviation from the manufacturer's installation procedures must be supported by a written certification on the manufacturer's letterhead and presented for the specifier's consideration.

1.12 WARRANTY:

A. Special Warranty: Manufacturer's, total system warranty covering both labor and material without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks. The maximum wind speed coverage shall be peak gusts of 60 mph measured at 10 meters above ground level. Certification is required with Bid Submittal that Manufacturer has reviewed and agreed to such coverage.

1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories roof insulation fasteners cover boards walkway products and other components of membrane roofing system.
2. Warranty Period: Fifteen (**15)** years from date of Substantial Completion.

a. Roofing Contractor's Bond: Submit roofing Installer's bond, on form at end of this Section, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover, and walkway products, for the following warranty period:

i. Warranty Period: Three (3) years from date of Substantial Completion.

PART II PRODUCTS

2.01 MANUFACTURERS

A. In other Part II articles where titles below introduce lists, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.

2.02 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: Uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced, and as follows:

1. Acceptable Manufacturers:

   a. Carlisle SynTec Incorporated.
   b. Firestone Building Products Company.
   c. DOW Roofing Systems..

2. Thickness: **60 mils (1.5 mm)** , nominal.
3. Exposed Face Color: **White**.
4. Physical Properties:

   a. Breaking Strength: 225 lbf (1 kN); ASTM D 751, grab method.
   b. Elongation at Break: 15 percent; ASTM D 751.
   c. Tearing Strength: 55 lbf (245 N) minimum; ASTM D 751, Procedure B.
   d. Brittleness Point: Minus 22 deg F (30 deg C).
   e. Ozone Resistance: No cracks after sample, wrapped around a 3-inch- (75-mm-) diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F (40 deg C) and an ozone level of 100 pphm (100 mPa); ASTM D 1149.
   f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F (116 deg C); ASTM D 573.
   g. Water Absorption: Less than 4 percent mass change after 166 hours' immersion at 158 deg F (70 deg C); ASTM D 471.
   h. Linear Dimension Change: Plus or minus 2 percent; ASTM D 1204.

2.03 AUXILIARY MATERIALS:

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, **55 mils (1.4 mm)** thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard solvent based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.

D. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

E. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch (25 mm) wide by 0.05 inch (1.3 mm) thick, prepunched.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

2.04 ROOF INSULATION:

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Base layer: Polyisocyanurate Board Insulation: ASTM C 1289, Type **II, glass-fiber mat** facer on both major surfaces.

1. Insulation available from the following Manufacturers may be used if approved by the manufacturer of the roofing membrane proposed:

   a. AlliedSignal Inc.; Commercial Roofing Systems.
   b. Apache Products Company.
   c. Atlas Roofing Corporation.
   d. Carlisle SynTec Incorporated.
   e. Celotex Corporation.
   f. Firestone Building Products Company.
   g. GAF Materials Corporation.
   h. GenFlex Roofing Systems.
   i. Hunter Panels, LLC.
   j. Johns Manville International, Inc.
   k. Koppers Industries.
   l. RMAX.

C. Insulation Overlay Board- ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, **1/4 inch** thick factory primed.

1. Products: Subject to compliance with requirements, **available products that may be incorporated into the Work include, but are not limited to, the following**:

   a. Georgia-Pacific Corporation; **Dens Deck Prime**.
   b. Equal product of other manufacturer.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

E. Minimum Total insulation R-Value: R-20.

2.05 INSULATION ACCESSORIES:

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

2.06 WALKWAYS:

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

PART III EXECUTION

3.01 EXAMINATION:

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck comply with requirements in Division 5 Section "Steel Deck."
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.03 INSULATION INSTALLATION:

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is **2 inches (50 mm)** or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

D. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation. Stagger joints horizontally and vertically if multiple layers of insulation are installed.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

F. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:

1. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m) and allow primer to dry.
2. Set each layer of insulation in a cold fluid-applied adhesive.
   a. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
      i. Fasten insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
3. Fasten first layer of insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
4. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   a. Install subsequent layers of insulation in a cold fluid-applied adhesive.

3.04 ADHERED ROOFING MEMBRANE INSTALLATION:

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing. Position sheets to accommodate contours of roof deck and shingle splices to avoid bucking water.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply solvent-based bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

1. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded section of the membrane sheet immediately after rolling the membrane into the adhesive with a soft bristle push broom to achieve maximum contact.
2. Fold back the unbonded half of the sheet lengthwise and repeat the bonding process.
3. Position adjoining sheets to allow a minimum overlap of 2 inches.
4. Hot air weld the membrane sheets using Hot Air Welding Machines or Hot Air Hand welder in accordance with the manufacturer’s hot air welding procedures.
5. Pull the membrane back along the welded splice so the entire underside of the membrane is exposed once the Hot Air Weld has been completed.
6. Apply Bonding Adhesive to the exposed underside of the membrane sheet and substrate.
7. Allow adhesive to dry until tacky and roll the membrane into the substrate and brush down the bonded section with a bristle broom as noted above.
8. Continue to install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches and complete the bonding procedures as stated previously.

E. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
4. Apply Cut Edge Sealant on all cut edges of reinforced membrane (where the scrim reinforcement is exposed) after seam probing is complete.

G. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.05 BASE FLASHING INSTALLATION:

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with sheet flashing.

D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.06 WALKWAY INSTALLATION:

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.07 FIELD QUALITY CONTROL:

A. Final Roof Inspection: Arrange for roofing system manufacturer's non-sales technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
2. Provide copies of written report to Contractor and Architect prepared by manufacturer's technical personnel citing required repairs or revisions necessary for issuance of warranty.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

1. Provide copies of written report to Contractor and Architect prepared by manufacturer's technical personnel citing correction of deficient work. This report will be a necessary component of closeout documents.

3.08 PROTECTING AND CLEANING:

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 62 00
FLASHING AND SHEET METAL

PART I GENERAL

1.01 SCOPE:

A. Provide all labor, equipment, and materials to fabricate and install edge strip and flashing, scuppers, trim and coping cap at parapets.

1.02 RELATED DOCUMENTS:

A. Applicable provisions of the General Conditions, Supplementary Conditions, and Division 1 General Requirements, apply to the work under this section.

Section	04 20 00	Unit Masonry
Section	06 10 00	Rough Carpentry
Section	07 13 00	Sheet Waterproofing
Section	07 27 20	Vaport Permiable fluid Applied Air Barrier
Section	07 31 13	Asphalt Shingles
Section	07 42 13	Metal Wall Panel
Section	07 46 16	Aluminum Siding
Section	07 54 00	Adhered TPO
Section	07 72 00	Roof Accessories
Section	07 92 00	Sealants and Caulking

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM)
   1. A653-00 Standard Specification for Steel Sheet, Zinc-Coated (galvanized) or Zinc-Iron Alloy-Coated (galvannealed) by the Hot-Dip Process.
   2. A792-99 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.
   3. B209-00 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   4. B221-00 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. Warnock Hersey International, Inc., Middleton, WI (WH)

C. Factory Mutual Research Corporation (FMRC)

D. Underwriters Laboratories (UL)

E. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
   1. 1993 Edition Architectural Sheet Metal Manual, 5th edition

F. National Roofing Contractors Association (NRCA)
   1. Roofing and Waterproofing Manual, 5th Edition

G. 1994 Edition Wind Design Guide for Use with Low Slope Roofing

1.04 SUBMITTALS:

A. Submit under provisions of Section 013300 - Submittals.

B. Product Data

C. Provide manufacturer's specification data sheets for each product in accordance with Section 013300.

D. Metal material characteristics and installation recommendations.

E. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specified can be approved.

F. Provide approval letters from metal manufacturer for use of their metal within this particular roofing system type.

G. Submit two (2) samples, illustrating typical metal edge, coping, gutters, fascia extenders for material and finish.

H. Provide 6” square sample of specified sheet materials for Architect approval.

I. Shop Drawings

1. For manufactured and shop fabricated gravel stops, fascia, scuppers, and all other sheet metal fabrications.
2. Shop drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, termination's, and installation details.
3. Indicate type, gauge and finish of metal.

J. Certification

1. Submit roof manufacturer's certification that metal fasteners furnished are acceptable to roof manufacturer.
2. Submit roof manufacturer's certification that metal furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.

1.05 QUALITY ASSURANCE:

A. Engage an experienced roofing contractor specializing in sheet metal flashing work with a minimum of five (5) years experience.

B. Successful contractor is required to maintain a full-time supervisor/foreman who is on the job-site at all times during installation of the new roof perimeter flashing. Foreman must have a minimum of five (5) years experience with the installation of similar system to that specified.

C. Successful contractor must obtain all components of roof system from a single manufacturer including any roll good materials, if required. Any secondary products that are required, which cannot be supplied by the specified manufacturer, must be recommended and approved in writing by the primary manufacturer prior to bidding.

D. If required, fabricator/installer shall submit work experience and evidence of adequate financial responsibility. The owners representative reserves the right to inspect fabrication facilities in determining qualifications.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.

B. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials which may cause discoloration or staining.

1.07 JOB CONDITIONS:

A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for pre-formed metal edge system.

1.08 DESIGN AND PERFORMANCE CRITERIA:

A. Thermal expansion and contraction: Completed metal edge flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance.

1.09 WARRANTIES:

A. Owner shall receive one (1) warranty from manufacturer of roofing materials covering all of the following criteria. Multiple warranties are not acceptable.

1. Pre-finished metal material shall require a written 20-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than

5 NBS color units per ASTM D-2244 or chalking excess of 8 units per ASTM D-659. If either occurs material shall be replaced per warranty, at no cost to the Owner.

2. Changes: Changes or alterations in the edge metal system without prior written consent from the manufacturer shall render the system unacceptable for warranty(ies).
3. Warranty shall commence on date of substantial completion or final payment, whichever is agreed by contract.
4. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be watertight and secure for a period of two years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work caused by such leaks or the repairs thereof.
5. Installing roofing contractor shall be responsible for the installation of the edge metal system in general accordance with the membrane manufacturer's recommendations.
6. Installing contractor shall certify that the edge metal system has been installed per the manufacturer's printed details and specifications.
7. One manufacturer shall provide a single warranty for all accessory metal for flashings, metal edges and copings, along with the warranty for metal roof areas, membrane roof areas, and any transitions between two different material types.

PART II PRODUCTS

2.01 MATERIALS:

A. Sheet Steel: Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Exposed base flashing metal material:
   a. Aluminum-zinc alloy (galvalume) coated steel, ASTM A792, coating designation AZ-50, in thickness of .0217 nom. /24 gauge or .0336 nom. 36" to 48" by coil length, chemically treated, commercial or lock-forming quality.
2. Unexposed base flashing metal material:
   a. Zinc-coated steel, ASTM A653, coating designation G-90, in thickness of 0.0299 nom. / 22 gauge; 36" to 48" by coil length, chemically treated, commercial or lock-forming quality.
3. Minimum gauge of steel or thickness of Aluminum to be specified in accordance with Architectural Sheet Metal Manual, Sheet Metal and Air Conditioning Contractor's National Association, Inc. recommendations.
4. Exposed surfaces for coated panels:
   a. Steel Finishes: fluorocarbon finish. Epoxy primer baked both sides, .2-.25 mils thickness as approved by finish coat manufacturer.

      Weathering finish as referred by National Coil Coaters Association (NCCA).

Property Test Method	Fluorocarbon*		
Pencil	ASTM D-3363	HB-H	
Hardness	NCAA II-2		
Bend	ASTM D-4145	O-T	NCAA II-19
Cross-Hatch	ASTM D-3359		
Adhesion	no loss of adhesion		
Gloss	ASTM D-523	25+/-5%	(60° angle)
Reverse Impact	ASTM D-2794	no cracking or loss of adhesion	
Nominal Thickness	ASTM D-1005		
primer	0.2 mils		
topcoat	0.8 mils		
TOTAL	1.0 mils		

*Subject to minimum quantity requirements

b. Color shall be as specified

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14, .032 inch thickness unless otherwise noted, finished as follows:

1. Mill Finish: One-side

2. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

2.02 RELATED MATERIALS:

A. Metal Primer: Zinc chromate type.

B. Plastic Cement: ASTM D 4586

C. Sealant: Non-hardening sealant shall be Temco Mono 1-part acrylic terpolymer sealant or approved equal.`

D. Underlayment: ASTM D2178, No15 asphalt saturated roofing felt.

E. Slip Sheet: Rosin sized building paper.

F. Fasteners:

1. Corrosion resistant screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.

2. Fastening shall conform to Factory Mutual 1-45 requirements or as stated on section details, whichever is more stringent.

2.03 METAL COPING:

A. Coping on buildings shall be Permasnap 24 gage prefinished steel (.050 Prefinished aluminum), Snap-Lok coping, as manufactured by Hickman, or approved equal of or Construction Specialties. Coping system shall include coping cover, gutter/splice plate, anchor plate, seal strips, anchors, and all accessories.

B. Finish on coping shall be Kynar 500 in color to match fascia, gutters and downspouts.

C. A shop fabricated coping system formed from 24 gauge prefinished paintgrip galvanized steel (.050 Prefinished aluminum), (Kynar 500) constructed in accordance with Figure 3-4A SMACNA 5th Edition may be used in lieu of the above referenced manufactured systems. Provide 6” wide cover plates and gutter bars at joints. Submit detailed shop drawings of accessories and connections for review.

2.04 THROUGH WALL METAL SCUPPER:

A. Scuppers shall be a shop fabricated to conform to Figure 1-26 SMACNA 5th edition.

B. Downspouts shall be fabricated from 26 gage steel in accordance with Plate 1-32 B SMACNA 5th Edition.. Provide downspout hangers of 24 gage G-90 galvanized steel fabricated in accordance with Figure 1-35 H SMACNA 5th edition. Locate downspout hangers 6 feet apart maximum, no more than 2 feet from the top and bottom of the downspout. Provide a minimum of 2 hangers per downspout.

2.05 WATERPROOF UNDERLAYMENT UNDER COPINGS:

A. Self-Adhering Sheet Underlayment, High Temperature: Minimum of 30- to 40-mil- (0.76- to 1.0-mm-) thick, slip-resisting, polyethylene-film-reinforced top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release paper backing; cold applied. Provide primer for adjoining concrete or masonry surfaces to receive underlayment.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
3. Acceptable Products:

   a. Carlisle Coatings & Waterproofing, Div. of Carlisle Companies; Dri-Start "HR."
   b. Grace, W. R. & Co.; Vycor Ultra
   c. Henry Company; Perma-Seal PE.
   d. SafSeal Innovations; SafSeal 6640.
   e. TC MiraDRI; WIP 300HT.

2.06 THROUGH WALL FLASHING:

A. Fabric thru-wall flashing shall be Sandell Copper Fabric Flashing with 3 oz. per square foot copper sheet, manufactured by Sandell Manufacturing Company, Inc. Cambridge, Mass.; Wasco Copper Fabric Flashing with 5 oz. per square foot copper sheet, manufactured by Wasco Products, Inc., Sanford, Maine, or approved substitute.

1. Flashing shall be embedded in the mortar joint of CMU backup walls or attached to metal stud walls with metal termination bar.
2. Joints in Flashing shall be made by lapping a minimum of 4 inches and coating surfaces with Sandell Asphalt Trowel Mastic.

B. Provide 1/8 in thick by 1 inch type 304 stainless steel termination bar at attachment of through wall flashing to metal stud walls. Attach termination bar to framing at 16 inches on center with self taping screws.

1. Acceptable products:
   Type T1 as manufactured by Hohmann& Barnard Inc.
   Termination bar as manufactured by Heckmann Building Products
   Termination bar as manufactured by Sandell Manufacturing
   Termination bar as manufactured by Wire Bond
   Equal products of other manufacturers approved prior to bidding.

C. Sealant for top of termination bar shall be a multicomponent non-sagging urethane sealant complying with ASTM C920 for type M, Grade NS, class 25, Uses A, G, M, and O as applicable to joint substrates. Provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C920 for uses indicated. Acceptable manufacturers include DAP, Pecora, Sonneborn, and Tremco.

1. Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement.

2.07 BASE AND COUNTER FLASHING

A. Base and Counter Flashing associated with roof to wall intersections shall be fabricated in accordance with Figure 4-7A SMACNA 5th ed.

1. Separate pieces of base flashing are installed as each course of shingles is applied. The upper edge of each piece of flashing should extend 2 inches above each course of shingles. The lower edge should be ½ inch above the butts of the singles forming the next course. Flashing must extend up the wall and onto the roof a minimum of 4 inches . Flashing pieces are nailed to the roof sheathing above the top of each shingle course

2. Counter flashing is installed in a reglet left by the mason or cut by the Contractor. Wedges or tension formig shapes are used to hold the counter flashing in place and the reglet is filled with a compatable sealant. The length of each piece of counter flashing will vary with the slope of the roof but no step should be more than 8 inches high. The width will vary but should always be wide enough to cover 4 inches of the base flashing.

PART III EXECUTION

3.01 COORDINATION:

A. Coordinate the installation of sheet metal work with the work of other trades, e.g. thru-wall flashing and counterflashing with installation of masonry work.

3.02 PROTECTION:

A. Dissimilar metals shall not be allowed to come in contact with each other. Isolate any dissimailar metals, masonry or concrete, from metals using bituminous paint, tape, or slip sheet. Use gasketed fasteners where required to prevent corrosive actions.

3.03 GENERAL:

A. Fastening of metal to walls and wood blocking shall comply with SMACNA Architectural Sheet Metal Manual, Factory Mutual I-60 wind uplift specifications and/or manufacturer's recommendations whichever is of the highest standard.

B. All accessories or other items essential to the completeness of sheet metal installation,whether specifically indicated or not, shall be provided and of the same material as item to which applied.

C. Allow sufficient clearences for expansion and contraction of linear metal components. Secure metal using fasteners as required by the system. No exposed face fastening shall be accepted.

3.04 INSPECTION:

A. Verify curbs are solidly set and nailing strips located.
B. Beginning of installation means acceptance of existing conditions.
C. Field measure site conditions prior to fabricating work.
D. Edge metal installation shall not disrupt other trades. Verify that substrate is dry, clean and free of foreign matter.

3.05 MANUFACTURED SHEET METAL SYSTEMS:

A. Installing Contractor shall be responsible for determining if the edge metal systems are in general conformance with roof manufacturer's recommendations.
B. Furnish and install manufactured fascia and coping cap systems in strict accordance with manufacturer's printed instructions.
C. Provide all factory-fabricated accessories including, but not limited to, fascia extenders, miters, scuppers, joint covers, etc.

3.06 COPINGS:

A. Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch (600-mm) centers.
2. Anchor interior leg of coping with screw fasteners and washers at 24-inch (600-mm) centers.

3.07 SOLDERING:

A. Clean and roughen edges to be soldered. Apply non-corrosive flux precoat to the surfaces to be joined with solder alloy for a distance of 1-1/2" back from edge of metal. Remove flux residue with clean water. Assemble the parts and solder, using regular non-corrosive rosin flux.

B. Soldering shall be used for sealing only and joints that must withstand mechanical stresses shall be riveted or screwed in addition to soldering.

C. Solder shall be 50-50 tin lead type.

3.08 SHOP FABRICATED SHEET METAL:

A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.

B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.

C. Hem exposed edges.

D. Angle bottom edges of exposed vertical surfaces to form drip.

E. All corners for sheet metal shall be lapped with adjoining pieces fastened andset in sealant.

F. Joints for gravel stop fascia system, coping cap shall be formed with a 3/8" opening between sections. The opening shall be backed by an internal drainage plate formed to the profile of fascia piece.

G. Install sheet metal to comply with Architectural Sheet Metal manual, Sheet Metal and Air Conditioning Contractor's National Associations, Inc.

3.09 FLASHING MEMBRANE INSTALLATION:

A. Scupper Through Roof Edge

1. Install scupper box in a one-quarter (1/4) inch bed of mastic. Assure all box seams are soldered and have minimum four (4) inch flange. Make sure all corners are closed and soldered.
2. Prime metal edge at a rate of one-hundred (100) square feet per gallon and allow to dry.

B. Coping Cap Detail

1. Install Miters first.
2. Position base flashing of Modified Roofing membrane over the wall edge covering nailers completely, fastening eight (8) inches on center. Install membrane and cap sheet with proper material and procedure according to manufacturers's recommendations.
3. Install minimum twelve (12) inch wide anchor chair at five (5'-0") feet on center.
4. Install 8" wide splice plate by centering over 12" wide anchor chair. Apply two beads of sealant to either side of the splice plate's center. Approximately 2" in from the coping cap joint. Install Coping Cap by hooking outside hem of coping on outside face of anchor chair. Press downward on inside edge of coping until "snap" occurs and hem is engaged on the entire chair.

3.10 FABRIC THRU-WALL FLASHING:

A. Install thru-wall flashing continuous near base of all exterior walls, just below drip openings in face brick wythe, and elsewhere as shown on the drawings. Flashing shall be laid in a slurry of fresh mortar and topped with a fresh full bed of mortar. Flashing shall start flush with outside face of wall, cross the cavity on mortar bed and extend up on the face of the inner wythe a minimum of 6" and be turned back into concrete block mortar joint or attached to the wall with termination bar and sealant.

B. **Head and Sill Flashing**:
The flashing shall start flush with the outside of the wall or lintel angle, then carried through or up the wall as indicated. Flashing shall extend 6" beyond each side of the opening and be turned up at the sides forming a pan. All corners shall be folded, not cut.

C. **Other Areas:**

All membrane flashing at other locations shall be installed in accordance with manufacturer's recommendations.

D. **Joining of Material:**

Joint shall be made by lapping a minimum of 4" and coating the contacting surfaces with Mastic recommended by the manufacturer.

END OF SECTION

SECTION 07 65 00
PEEL AND STICK FLASHING

PART 1 GENERAL

1.01 SCOPE:

A. Furnish all labor, materials and equipment, and perform all work to install peel and stick polyethylene faced rubberized asphalt flashing as shown on the drawings and as specified herein.

1.02 RELATED DOCUMENTS:

A. Applicable provisions of the General Conditions, Supplementary Conditions and Division 1, General Requirements, apply to the work under this section.

1.03 SUBMITTALS:

A. Submit manufacturer's data, installation instructions, and 6" square samples of specified sheet materials to the Architect for approval.

1.04 PROJECT CONDITIONS:

A. Store flashing materials in protected location safe from soiling with and water with temperatures maintained above 50° F.

B. Do not store materials exposed to direct sunlight.

PART II PRODUCTS

2.01 MANUFACTURER:

A. Provide one of the following product systems by the indicated manufacturer:

1. Vycor Plus self-adhering flashing as manufactured by Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA 02140, 866-333-3726, Fax: 410-431-7281
2. BT020XL self-adhering flashing as manufactured by Protecto Wrap Company, 2255 South Delaware Street, Denver, CO 80223, Phone: 800-759-9727 or 303-777-3001, Fax: 303-777-9273
3. Tyvek® Flashing System as manufactured by DuPont, P.O. Box 80728, Wilmington, Delaware 19880-0728, 800-448-9835

2.02 SURFACE PRIMERS:

A. Primer or Spray Adhesive must be used on weathered surfaces, masonry, concrete, OSB sheathing and fiberglass matt faced gypsum sheathing. Primer or spray adhesive must be used in applications with temperatures below 45° F.

PART III EXECUTION

3.01 COORDINATION:

A. Coordinate the installation of sheet metal work with the work of other trades, e.g., thru-wall flashing and counter-flashing and with the installation of windows and doors.

3.02 CONDITIONS:

A. Surfaces should be clean, dry, free of dirt and other foreign matter.

B. There should be no solvent-based caulks used in conjunction with peel and stick flashing.

C. Peel and stick flashing should be applied at a temperature above 45° F (7° C). For applications from 20° F to 45° F (-6° C to 7° C), the material must be stored in a warm area prior to use.

D. Work shall be installed as detailed and in accordance with the manufacturer's latest printed instructions, unless otherwise approved by the Architect in writing. Requests for permission to use alternate materials, methods, and details shall be submitted to the Architect, in writing, and shall fully describe the proposed alternatives and the reasons for such proposed changes.

3.03 PRIMER APPLICATION:

A. Apply primer to all surfaces by roller or brush.

B. Primed surface shall be free of runs, puddles or excessive primer as this could cause blistering. Brush or roll out all primer puddles or drips immediately.

C. Prime only as much area as can be covered in half a day's work. Re-prime areas not covered in half a day's work with a light coat of Primer.

D. The opened containers, when not in use, should have the lids replaced so as to lessen the evaporation of the solvents.

E. Some bubbling in the primer may occur on the surface as it cures. This has no effect on the performance of the product and will smooth out as the membranes are applied.

3.04 SPRAY ADHESIVE APPLICATION:

A. Shake can before using.

B. Turn spray tip so arrow points to dot on rim.

C. Hold can 6 - 8 inches from surface to be sprayed and apply to surface.

D. After use, invert can, depress spray tip until spray is free of adhesive. Clean spray tips with turpentine.

E. Clean oversprayed areas with a mix of 25% - 30% water added to isopropyl alcohol.

3.05 INSTALLING FLASHING:

A. Self-Adhered Flashing must be continuously supported by the substrate and must not span or bridge joints, gaps or voids in excess of 1/4" (6.4 mm). End laps that occur in subsequent lengths must maintain a minimum overlap of 2" (51 mm).

B. Begin installation at the bottom of openings and work toward the top lapping all joints to excluded moisture penetration.

C. Move along opening or joint, being careful to put flashing as evenly as possible over the opening and avoiding fishmouths along the edges.

D. Press flashing firmly into place with heavy hand pressure as soon as possible, to ensure continuous and intimate contact with the substrate.

E. If wrinkles develop, carefully cut out affected area and replace in the similar procedure outlined above. The repair piece also must be pressed into place with heavy hand pressure as soon as possible to ensure continuous and intimate contact with the substrate.

F. Rolling the flashing is essential to gain 100% surface contact of the flashing adhesive to the substrate and will minimize trapping air beneath the tape.

G. Care should be taken not to leave the membrane exposed to direct sunlight for over 120 days.

H. Do not stretch the flashing membrane. Stretching will adversely affect the adhesion of the product.

I. Lap building wrap material 4" on top of flashing and seal the building wrap to flashing.

END OF SECTION

SECTION 07 71 00

ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings, fascias, gravel stops, vents, and copings, fascias, gravel stops, and vents..

B. Roof control, expansion, and _____ joint covers.

C. Roof membrane vents.

1.02 RELATED REQUIREMENTS

A. Section 07 72 00 - Roof Accessories: Manufactured curbs, roof hatches, and snow guards.

1.03 REFERENCE STANDARDS

A. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

E. NRCA (RM) - The NRCA Roofing Manual; 2019.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

G. SPRI ES-1 - Wind Design Standard for Edge Systems used with Low Slope Roofing Systems; Single Ply Roofing Industry; 2011. (ANSI/SPRO/FM 4435/ES-1)

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Samples: Submit two color chips, 2 inch wide by 2 inch high, illustrating component shape, finish, and color.

E. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. Architectural Products Co; _____: www.archprod.com/#sle.
   2. ATAS International, Inc; Rapid-Lok Fascia: www.atas.com/#sle.
   3. Metal-Era Inc; _____: www.metalera.com/#sle.
   4. Metal Roofing Systems, Inc; Rapid Lock Coping: www.metalroofingsystems.biz/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Control and Expansion Joint Covers:
   1. Construction Specialties, Inc; Roof Covers: www.c-sgroup.com/#sle.
   2. EMSEAL Joint Systems, Ltd; Emseal RoofJoint: www.emseal.com/#sle.
   3. GAF; ____: www.gaf.com/#sle.

4. Johns Manville; ____: www.jm.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

C. Louvered Vents:

D. Pipe and Penetration Flashings:
1. Elmdor Stonemen; _____: www.elmdorstoneman.com/#sle.
2. Portals Plus; _____: www.portalsplus.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

E. Counterflashings:
1. ATAS International, Inc; ____: www.atas.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

F. Pipe Penetration Wall Seal:
1. Airex Manufacturing, Inc; Airex Titan Outlet: www.airexmfg.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
1. Configuration: Fascia, cant, and edge securement for roof membrane.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
3. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
4. Finish: 70 percent polyvinylidene fluoride.
5. Color: To be selected by Architect from manufacturer's standard range.
6. Manufacturers:
a. WP Hickman Company; Extruded TerminEdge: www.wph.com.
b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Copings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
3. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
4. Color: To be selected by Architect from manufacturer's standard range.
5. Manufacturers:
a. SAF Perimeter Systems, a diviion of Southern Aluminum Finishing Company, Inc.; www.saf.com/persys.
b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Control and Expansion Joint Covers: Composite construction of ____ inch wide flexible EPDM flashing of white color with closed cell urethane foam backing, each edge seamed to aluminum sheet metal flanges, designed for nominal joint width of 1 inch. Include special formed corners, tees, intersections, and wall flashings, each sealed watertight.

D. Roofing Vents: Formed aluminum ____ inch thick, with watertight construction to allow construction below roof membrane to breathe; with attachment flanges ____ inch wide.
1. Finish: Mill finish.
2. Color: To be selected by Architect from manufacturer's standard range.

E. Attic Vents: Linear type; aluminum, ____ inch thick, color coated, formed to permit installation with shingle roofing and to shed water. Fabricate with at least ___ sq ft of ventilation opening for every ___ sq ft of area being ventilated.

1. Finish: Mill finish.
2. Color: To be selected by Architect from manufacturer's standard range.

F. Pipe and Penetration Flashing: Base of rounded aluminum, compatible with sheet metal roof systems, and capable of accomodating pipes sized between 3/8 inch and 12 inch.
1. Caps: EPDM.
2. Color: As indicated on drawings.

G. Engineered Roof Ventilation:
1. Ridge Vent System: Factory fabricated, formed panels with integral attachment flanges and snap-on cover.
a. Perforated Screen: 0.050 inch thick aluminum.
b. Brackets: Manufacturer's standard 20 gage (0.0359 inch)
2. Eave Vent System: Factory fabricated, formed panels with integral attachment flanges and snap-on cover.
a. Perforated Screen: 24 gage (0.0239 inch) galvanized steel; with 54 percent open area perforation.
b. Finish Color: To be selected by Architect from manufacturer's standard range.
c. Manufacturers:
1) Atlas Roofing Corporation; Techni-Flo EV: www.atlasroofing.com/#sle.
2) Substitutions: See Section 01 60 00 - Product Requirements.
3. Counterflashings: Factory fabricated and finished sheet metal that overlaps top edges of base flashing by at least 4 inches, and designed to snap into thru-wall flashing or reglets with lapped joints.

2.03 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

C. Insulation Board Adhesive: Two-component, low-rise polyurethane foam adhesive used for adhering insulation to low slope roof deck materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.
1. Refer to Section 07 72 00 for information on roofing related accessories.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Seal joints within components when required by component manufacturer.

C. Anchor components securely.

D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

F. Coordinate installation of flashing flanges into reglets.

END OF SECTION

SECTION 07 71 23

MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Downspout boots.

B. Section 07 61 00 - Sheet Metal Roofing.

C. Section 07 62 00 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Comply with applicable code for size and method of rain water discharge.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

C. Samples: Submit two samples, 6 inch long illustrating component design, finish, color, and configuration.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:
   1. ATAS International, Inc: www.atas.com/#sle.
   2. Cheney Flashing Company; ____: www.cheneyflashing.com/#sle.
   3. Drexel Metals Inc; _____: www.drexmet.com/#sle.
   4. SAF Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc; ____: www.saf.com/persys/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Scupper and Collectors:
   1. ATAS International, Inc; Scuppers and Collector Boxes: www.atas.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Aluminum Sheet: ASTM B209 (ASTM B209M); 0.032 inch thick.
   1. Color: As selected from manufacturer's standard colors.

2.03 COMPONENTS

A. Gutters: Profile as indicated.

B. Downspouts: Profile as indicated.

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: In accordance with CDA requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

D. Fasteners: Galvanized steel, with soft neoprene washers.

2.04 ACCESSORIES

A. Downspout Boots: Cast iron; ASTM A48.

2.05 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

C. Slope gutters as indicated on drawings inch per foot.

END OF SECTION

SECTION 07 72 00
ROOF HATCH

PART I GENERAL

1.01 SCOPE:

A Furnish all material, labor, equipment, and supervision necessary to fabricate, and install roofing accessories where shown on the drawings and as specified herein.

1.02 RELATED DOCUMENTS:

A Applicable provisions of the General Conditions, Supplementary Conditions and Division 1, General Requirements, apply to the work under this section.

1.03 SUBMITTALS:

A Submit shop drawings in accordance with Section 013000.

PART II PRODUCTS

2.01 ROOF SCUTTLE:

A Roof access hatches shall be Type S-20, manufactured by the Bilco Company, New Haven, Connecticut, or approved equal.

B Cover shall be #14 gauge galvanized bonderized steel with 3" beaded flange, neatly welded, insulation with 1" thick glass fiber, fully covered and protected by #22 gauge galvanized steel liner.

C Curb shall be 12" high or same gauge and material as cover, formed with 3-1/2" flange with holes for securing to roof deck. Curb shall be equipped with integral metal cap flashing of same gauge and material as the curb, full welded at corners for weathertightness. Insulation on exterior of the curb shall be 1" thick rigid fiberboard.

D Hatch shall be completely assembled with heavy pintle hinges, compression spring operators enclosed in telescoping tubes, positive snap latch with turn handles and padlock hasps inside and outside, and neoprene draft seal. Cover shall be equipped with automatic hold-open arm complete with red vinyl handle to permit easy one-hand release. All hardware shall be cadmium plated, and factory finish shall be paint bond.

E Manufacturer shall guarantee proper operation and against defects in material or workmanship for a period of five years.

PART III EXECUTION

3.01 INSTALLATION:

A Install roof scuttle systems as shown on the drawings and in accordance with approved shop drawings.

END OF SECTION

SECTION 07 81 00

APPLIED FIREPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fireproofing of interior structural steel not exposed to damage or moisture.

B. Preparation of fireproofing for application of exposed finish specified elsewhere.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing.

B. Section 05 21 00 - Steel Joist Framing.

C. Section 05 31 00 - Steel Decking.

D. Section 07 05 53 - Fire and Smoke Assembly Identification.

E. Section 07 81 23 - Intumescent Fire Protection.

F. Section 07 84 00 - Firestopping.

G. Section 09 21 16 - Gypsum Board Assemblies: Gypsum board fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

B. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993, with Editorial Revision (2015).

C. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2017.

D. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members; 1992, with Editorial Revision (2015).

E. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993, with Editorial Revision (2015).

F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

G. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data indicating product characteristics.

C. Manufacturer's Certificate: Certify that applied fireproofing products meet or exceed requirements of Contract Documents.

D. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, as follows:
   1. Bond strength.
   2. Bond impact.
   3. Compressive strength.
   4. Fire tests using substrate materials similar those on project.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Field Quality Control Submittals: Submit field test report.

G. Manufacturer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.07 FIELD CONDITIONS

A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F or when temperature is predicted to be below said temperature for 24 hours after application.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

D. Do not allow roof traffic during installation of roof fireproofing and drying period.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.
   1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
   2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Applied Fireproofing:
   1. GCP Applied Technologies; _____: www.gcpat.com/#sle.
   2. Isolatek International Corp; _____: www.isolatek.com/#sle.
   3. Southwest Fireproofing Products Company; ____: www.sfrm.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIREPROOFING ASSEMBLIES

A. Provide assemblies as indicated on drawings.

B. UL listings with a Load Restriction are not allowed.

C. Provide fire resistance ratings for following building elements as required by local building code:
   1. Primary structural frame, including columns, girders, and trusses, Rating and UL # per drawings hours.
   2. Bearing walls, exterior, Rating and UL # per drawings hours.
   3. Bearing walls, interior, Rating and UL # per drawings hours.
   4. Nonbearing walls and partitions, exterior, Rating and UL # per drawings hours.
   5. Nonbearing walls and partitions, interior, Rating and UL # per drawings hours.
   6. Floor construction, including supporting beams and joists, Rating and UL # per drawings hours.
   7. Roof construction, including supporting beams and joists, Rating and UL # per drawings hours.

2.03 MATERIALS

A. Applied Fireproofing Material for Interior Applications, Concealed: Manufacturer's standard factory mixed material, which when combined with water is capable of providing indicated fire resistance, and complying with following requirements:

1. Bond Strength: 150 pounds per square foot, minimum, when tested in accordance with ASTM E736/E736M when set and dry.
2. Compressive Strength: 8.33 pounds per square inch, minimum.
3. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.
4. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937/E937M.
5. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.
6. Fungal Resistance: No growth after 28 days when tested according to ASTM G21.

2.04 ACCESSORIES

A. Primer Adhesive: Of type recommended by applied fireproofing manufacturer.

B. Overcoat: As recommended by manufacturer of applied fireproofing material.

C. Water: Clean, potable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled.

E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.02 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Apply fireproofing manufacturer's recommended bonding agent on primed steel.

E. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

F. Close off and seal duct work in areas where fireproofing is being applied.

3.03 APPLICATION

A. Apply primer adhesive in accordance with manufacturer's instructions.

B. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.

C. Apply overcoat at the rate recommended by fireproofing manufacturer.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00 - Quality Requirements.

B. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.
   1. Submit field test reports promptly to Contractor and Architect.

C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).

D. Repair or replace applied fireproofing at locations where test results indicate fireproofing does not meet specified requirements.

E. Re-inspect installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.05 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

C. At exposed fireproofing, clean surfaces that have become soiled or stained, using manufacturer's recommended procedures.

END OF SECTION

SECTION 07 81 23

INTUMESCENT FIRE PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thin-film intumescent fire protection.

B. Compressible-rod intumescent fire protection.

C. Protective and/or decorative topcoats.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing.

B. Section 05 21 00 - Steel Joist Framing.

C. Section 07 05 53 - Fire and Smoke Assembly Identification.

D. Section 07 81 00 - Applied Fireproofing: Conventional cementitious and mineral fiber fireproofing.

E. Section 09 91 23 - Interior Painting: Field-applied paints matching intumescent fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2019.

B. SSPC-PA 2 - Procedure For Determining Conformance To Dry Coating Thickness Requirements; 2015.

C. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Performance characteristics and test results.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Selection Samples: For decorative top coat, color chips representing manufacturer's full range of available colors and sheens.

D. Verification Samples: For each thickness, color, sheen, and finish required, submit samples not less than 4 inch square on designated substrate illustrating finished appearance.

E. Certificates: Certify that intumescent fireproofing provided for this project meets or exceeds specified requirements in all respects.

F. Field Quality Control Submittals: Submit field test report.

G. Manufacturer's Qualification Statement.

H. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s original, unopened containers with identification labels and testing agency markings intact and legible.

B. Store products in manufacturer's unopened packaging until ready for installation.

1. Store at temperatures not less than 50 degrees F in dry, protected area.
2. Protect from freezing, and do not store in direct sunlight.
3. Dispose of any materials that have come into contact with contaminants of any kind prior to application.

C. Dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Protect areas of application from windblown dust and rain.

B. Maintain ambient field conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under ambient conditions outside manufacturer's absolute limits.
1. Provide temporary enclosures as required to control ambient conditions.
2. Do not apply intumescent fireproofing when ambient temperatures are below 50 degrees F without specific approval from manufacturer.
3. Maintain relative humidity between 40 and 60 percent in areas of application.
4. Maintain ventilation in enclosed spaces during application and for not less than 72 hours afterward.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Intumescent Thin-Film Fire Protection:
1. Hilti, Inc; Fire Finish Steel Protection Spray CFP-SP WB: www.us.hilti.com/#sle.
2. Isolatek International Corp; _____: www.isolatek.com/#sle.

B. Intumescent Compressible-Rod Fire Protection:
1. CEMCO; HOTROD Type-X Compressible Firestopping: www.cemcosteel.com/#sle.

2.02 SYSTEM REQUIREMENTS

A. Fireproofing: Provide intumescent thin-film and compressible-rod fire protection systems tested by an independent testing agency in accordance with ASTM E119 and acceptable to authorities having jurisdiction (AHJ).
1. Provide assemblies listed by UL or FM and bearing listing agency label or mark.

B. Structural Steel Columns: Fire resistance rating of Rating and UL # per drawings.

C. Structural Steel Beams: Fire resistance rating of Rating and UL # per drawings.

D. Structural Steel Beams and Exposed Steel Deck: Fire resistance rating of Rating and UL # per drawings.

E. Exposed Steel Deck: Fire resistance rating of Rating and UL # per drawings.

2.03 MATERIALS

A. Fire Resistive Coating System: Thin-film intumescent fire protection system for structural steel, gypsum board, wood, oriented strand board (OSB), concrete, and concrete masonry units (CMU).
1. For Interior Use:
a. Use only water-based products.
b. Use only products without fiber content.
c. Basis of Design: Hilti, Inc; Fire Finish Steel Protection Spray CFP-SP WB: www.hilti.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.
2. For Exterior Use:
a. Use only epoxy-based products.
b. Use only products without fiber content.
c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Resistive Compressible-Rod System: Compressible intumescent fire protection system for structural steel, gypsum board, wood, oriented strand board (OSB), concrete, and concrete masonry units (CMU).

C. Protective and Decorative Top Coating: As recommended by fireproofing manufacturer for exposure and substrate conditions.
   1. Color and Gloss: As selected by Architect.
   2. Coordinate with paint as specified in Section 09 91 23 for color and sheen to match between intumescent fireproof coating and adjacent painted surfaces.

D. Sealers and Primer: As required by tested and listed assemblies, and recommended by fireproofing manufacturer to suit specific substrate conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates to determine if they are in satisfactory condition to receive intumescent fire protection; verify that substrates are clean and free of oil, grease, incompatible primers, or other foreign substances capable of impairing bond to fireproofing system.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Thoroughly clean surfaces to receive fireproofing.

B. Repair substrates to remove surface imperfections that could effect uniformity of texture and thickness of fireproofing system, and remove minor projections and fill voids that could telegraph through finished work.

C. Cover or otherwise protect other work that might be damaged by fallout or overspray of fireproofing system, and provide temporary enclosures as necessary to confine operations and maintain required ambient field conditions.

3.03 APPLICATION

A. Comply with manufacturer's instructions for each particular intumescent fire protection system installation application as indicated.

B. Apply manufacturer’s recommended primer to required coating thickness.

C. Apply fireproofing to full thickness over entire area of each substrate to be protected.

D. Apply coats at manufacturer’s recommended rate to achieve dry film thickness (DFT) as required for fire resistance ratings designated for each condition.

E. Apply intumescent fire protection by spraying to maximum extent possible, and as necessary complete coverage by roller application or other method acceptable to manufacturer.

F. Achieve uniform finished appearance complying with approved samples.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00 - Quality Requirements.
   1. Arrange for testing of installed intumescent fire protection by an independent testing laboratory using magnetic pull-off dry film thickness gage in accordance with SSPC-PA 2, and ensure it meets requirements of authorities having jurisdiction (AHJ).
   2. Submit field test reports promptly to Contractor and Architect.

B. Repair or replace intumescent fire protection at locations where test results indicate fireproofing does not meet specified requirements.

3.05 CLEANING

A. Immediately after installation of fireproofing in each area, remove overspray and fallout from other surfaces and clean soiled areas.

3.06 PROTECTION

A. Protect installed intumescent fire protection from damage due to subsequent construction activities, so fireproofing is without damage or deterioration before Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.

B. Section 07 05 53 - Fire and Smoke Assembly Identification.

C. Section 07 81 00 - Applied Fireproofing.

D. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2019.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015.

D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops; 2018.

E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2010a (Reapproved 2015).

F. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products; _____: www.3m.com/firestop/#sle.
   2. A/D Fire Protection Systems Inc; _____: www.adfire.com/#sle.
   3. Hilti, Inc; _____: www.us.hilti.com/#sle.

4. Nelson FireStop Products; _____: www.nelsonfirestop.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

B. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING FOR FLOOR-TO-WALL JOINTS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by KCDC, will examine penetration firestopping in accordance with ASTM E2174, and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 07 13 00 - Sheet Waterproofing: Sealing cracks and joints in waterproofing substrate surfaces using materials specified in this section.

C. Section 07 25 00 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.

D. Section 07 84 00 - Firestopping: Firestopping sealants.

E. Section 07 95 13 - Expansion Joint Cover Assemblies: Sealants forming part of expansion joint cover assemblies.

F. Section 08 71 00 - Door Hardware: Setting exterior door thresholds in sealant.

G. Section 08 80 00 - Glazing: Glazing sealants and accessories.

H. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

I. Section 09 22 16 - Non-Structural Metal Framing: Sealing between framing and adjacent construction in acoustical and sound-rated walls and ceilings.

J. Section 09 23 00 - Gypsum Plastering: Sealing acoustical and sound-rated walls and ceilings.

K. Section 09 26 13 - Gypsum Veneer Plastering: Sealing acoustical and sound-rated walls and ceilings.

L. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

M. Section 23 31 00 - HVAC Ducts and Casings: Duct sealants.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.

B. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2018.

C. ASTM C834 - Standard Specification for Latex Sealants; 2017.

D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2018.

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

H. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).

I. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

J. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience and approved by manufacturer.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver to manufacturer sufficient samples for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
   6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Hilti, Inc; _____: www.us.hilti.com/#sle.
   2. Pecora Corporation; _____: www.pecora.com/#sle.
   3. Sika Corporation; _____: www.usa-sika.com/#sle.
   4. Tremco Commercial Sealants & Waterproofing; ____: www.tremcosealants.com/#sle.
   5. W.R. Meadows, Inc; _____: www.wrmeadows.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
   1. Dow Chemical Company; _____: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   2. QUIKRETE Companies; _____: www.quikrete.com/#sle.
   3. Sika Corporation; _____: www.usa-sika.com/#sle.
   4. Tremco Commercial Sealants & Waterproofing; ____: www.tremcosealants.com/#sle.
   5. W.R. Meadows, Inc; _____: www.wrmeadows.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
      c. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Intentional weepholes in masonry.
      b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
      c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      d. Joints where installation of sealant is specified in another section.
      e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag elastomeric sealant, single component Mildew-Resistant Neutral-Curing Silicone Sealant sealant, unless otherwise indicated.

C. []Interior Joints: Use non-sag [] sealant, Pecora Corporation; 898 or Tremco; Tremsil 600 White, unless otherwise indicated.
   1. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, and plumbing closets; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with levels of volatile organic compound (VOC) content as indicated in Section 01 61 16.

B. Colors: As selected by Architect.

2.04 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Color: Match adjacent finished surfaces.
   5. Manufacturers:
      a. Substitutions: See Section 01 60 00 - Product Requirements.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.

C. Type ___ - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus ____ percent, minimum.

D. Type ___ - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
   2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
   3. Open Cell: 40 to 50 percent larger in diameter than joint width.
   4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
   5. Manufacturers:
      a. ADFAST Corporation; ADSEAL BR-2600 (Backer Rod): www.adfastcorp.com/#sle.
      b. Nomaco, Inc; HBR: www.nomaco.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

END OF SECTION

SECTION 07 95 13

EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion joint cover assemblies for floor, wall, ceiling, soffit, and parking decks surfaces.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Placement of joint cover assembly frames in formwork.

B. Section 04 20 00 - Unit Masonry: Placement of joint cover assembly frames in masonry.

C. Section 04 20 01 - Masonry Veneer: Placement of joint cover assembly frames in masonry.

D. Section 04 29 00 - Engineered Unit Masonry: Placement of joint cover assembly frames in masonry.

E. Section 05 50 00 - Metal Fabrications: Custom fabricated metal expansion and control joint devices.

F. Section 07 62 00 - Sheet Metal Flashing and Trim: Roof expansion and control joint covers.

G. Section 07 71 00 - Roof Specialties: Roof expansion and control joint covers.

H. Section 07 92 00 - Joint Sealants: Sealing expansion and control joints using gunnable and pourable sealants.

I. Section 09 21 16 - Gypsum Board Assemblies: Gypsum board control joint trim.

J. Section 09 21 16 - Gypsum Board Assemblies: Placement of expansion joint assemblies in gypsum board walls and ceilings.

K. Section 09 51 00 - Acoustical Ceilings: Expansion joint assemblies in suspended ceiling grids.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

D. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 for additional provisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
   1. Architectural Art Mfg, Inc; _____: www.archart.com/#sle.
   2. Construction Specialties, Inc; _____: www.c-sgroup.com/#sle.
   3. Inpro; _____: www.inprocorp.com/#sle.
   4. MM Systems Corp; _____: www.mmsystemscorp.com/#sle.
   5. Nystrom, Inc; _____: www.nystrom.com/#sle.
   6. Pecora Corporation; ____: www.pecora.com/#sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Interior Floor Joints Subject to Thermal Movement:

B. Interior Wall/Ceiling Joints Subject to Thermal Movement:

C. Interior Non-Fire-Rated Wall/Ceiling Joints Subject to Seismic Movement:

D. Interior Fire-Rated Wall/Ceiling Joints Subject to Seismic Movement:

E. Interior Fire-Rated Wall/Ceiling/Floor Joints Subject to Thermal Movement:

F. Exterior Wall Joints Subject to Thermal Movement:

G. Exterior Wall Joints Subject to Seismic Movement:

H. Parking/Bridge Deck Joints:
   1. Manufacturers:
      a. EMSEAL Joint Systems, Ltd; Emshield DFR2 system: www.emseal.com/#sle.

I. Parking/Traffic Deck Joints Subject to Seismic Movement:
   1. Manufacturers:
      a. EMSEAL Joint Systems, Ltd; SJS-Seismic Joint System: www.emseal.com/#sle.

J. Fire-Rated Parking/Traffic Deck Joints Subject to Seismic Movement:
   1. Manufacturers:
      a. EMSEAL Joint Systems, Ltd; SJS-FR Seismic Joint System: www.emseal.com/#sle.

2.03 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
   1. Joint Dimensions and Configurations: As indicated on drawings.
   2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
   3. Joint Movement Capability: If not indicated, provide minimum plus/minus 25 percent joint movement capability.
   4. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
   5. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.

C. Covers In Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.

B. Resilient Seals:
   1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.
   2. For Pedestrian Traffic Applications: EPDM rubber, Neoprene, or Santoprene; no PVC; Shore A hardness of 40 to 50 Durometer.
   3. For Vehicular Traffic Applications: EPDM rubber, Neoprene, or Santoprene; no PVC; Shore A hardness of 40 to 50 Durometer.
   4. Color: To be determined by Architect.

C. Anchors and Fasteners: As recommended by cover manufacturer.

D. Ferrous Metal Anchors: Galvanized where embedded in concrete or in contact with cementitious materials.

E. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.02 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

3.03 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Accessories, including glazing, louvers, and matching panels.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

C. Section 09 91 13 - Exterior Painting: Field painting.

D. Section 09 91 23 - Interior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. HMMA: Hollow Metal Manufacturers Association.

C. NAAMM: National Association of Architectural Metal Manufacturers.

D. NFPA: National Fire Protection Association.

E. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

H. ITS (DIR) - Directory of Listed Products; current edition.

I. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

J. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

K. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

L. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.

M. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2018.

N. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

O. UL (DIR) - Online Certifications Directory; Current Edition.

P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Q. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   3. Fleming Door Products, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   4. Mesker, dormakaba Group; FDJ Series Drywall Frames: www.meskeropeningsgroup.com/#sle.
   5. Republic Doors, an Allegion brand; ____: www.republicdoor.com/#sle.
   6. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Accessibility: Comply with ICC A117.1 and ADA Standards.
   2. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   3. Door Edge Profile: Manufacturers standard for application indicated.
   4. Typical Door Face Sheets: Flush. Refer to Door Elevations & Schedule for more information..
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
   6. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115 in accordane with specified requirements
   7. Finish: Factory primed for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for

instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Model 1 - Full Flush.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inch, nominal.
   4. Weatherstripping: Refer to Section 08 71 00.

C. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Model 1 - Full Flush.
   2. Door Thickness: 1-3/4 inch, nominal.

D. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Model 1 - Full Flush.
   2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
   3. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
   4. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      a. Attach fire rating label to each fire rated unit.
   5. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
      a. Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
      b. Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
      c. Label: Include the "S" label on fire-rating label of door.
   6. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
   7. Door Thickness: 1-3/4 inch, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Face welded, seamless with joints filled. .
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
   2. Weatherstripping: Separate, see Section 08 71 00.

D. Interior Door Frames, Non-Fire Rated: Face welded type.

E. Door Frames, Fire-Rated: Face welded type.
   1. Fire Rating: Same as door, labeled.

F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

G. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

H. Frames in Masonry Walls: Size to suit masonry coursing with head member per drawings inch high to fill opening without cutting masonry units.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Glazing: As specified in Section 08 80 00, factory installed.

B. Astragals for Double Doors: Specified in Section 08 71 00.
   1. Fire-Rated Doors: Steel, shape as required for fire rating.

C. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Install door hardware as specified in Section 08 71 00.

F. Comply with glazing installation requirements of Section 08 80 00.

G. Coordinate installation of electrical connections to electrical hardware items.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 12 13
HOLLOW METAL FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal frames for non-hollow metal doors.

B. Fire-rated hollow metal frames for non-hollow metal doors.

C. Interior glazed borrowed lite frames.

1.02 RELATED REQUIREMENTS

A. Section 08 14 33 - Stile and Rail Wood Doors: Non-hollow metal door for hollow metal frames.

B. Section 08 71 00 - Door Hardware: Hardware, silencers, and weatherstripping.

C. Section 08 80 00 - Glazing: Glazed borrowed lites.

D. Section 09 91 13 - Exterior Painting: Field painting.

E. Section 09 91 23 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2007 (R2011).

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2017.

H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

L. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

M. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

N. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

O. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

E. Manufacturer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide hollow metal frames from SDI Certified manufacturer: www.steeldoor.org/sdicertified.php.

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Frames with Integral Casings:
   1. Ceco Door, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   3. Republic Doors, an Allegion brand; ____: www.republicdoor.com/#sle.
   4. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Refer to Door and Frame Schedule on the drawings for frame sizes, fire ratings, sound ratings, finishing, door hardware to be installed, and other variations, if any.

B. Door Frame Type: Provide hollow metal door frames with _____.
   1. Exterior Doors: Use frames with integral casings.
   2. Interior Doors: Use frames with applied casings.

C. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.

D. Accessibility: Comply with ICC A117.1 and ADA Standards.

E. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.

F. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

G. Mullions for Pairs of Doors: Fixed, with profile similar to jambs.

H. Frames for Interior Glazing or Borrowed Lites: Construction and face dimensions to match door frames, and as indicated on drawings.

2.03 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.04 ACCESSORIES

A. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Comply with glazing installation requirements of Section 08 80 00.

E. Install door hardware as specified in Section 08 71 00.

F. Coordinate installation of electrical connections to electrical hardware items.

G. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 14 33

STILE AND RAIL WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood doors, stile and rail design; fire rated, non-fire rated, and _____.

B. Panels of wood, glass, and louvers.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Wood door frames.

B. Section 08 11 13 - Hollow Metal Doors and Frames.

C. Section 08 12 13 - Hollow Metal Frames.

D. Section 08 71 00 - Door Hardware.

E. Section 08 80 00 - Glazing.

F. Section 09 91 23 - Interior Painting: Field finishing.

G. Section 09 93 00 - Staining and Transparent Finishing: Field finishing.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

C. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

D. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2019.

E. AWI (QCP) - Quality Certification Program; Current Edition.

F. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

G. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2018).

H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing and louvers.

D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

E. Manufacturer's Installation Instructions: Indicate special installation instructions.

F. Manufacturer's Qualification Statement.

G. Warranty, executed in KCDC's name.

1.05 QUALITY ASSURANCE

A. Maintain one copy of specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

C. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver, and store doors in accordance with quality standard specified.

B. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stile and Rail Wood Doors:
   1. Eggers Industries; ____: www.eggersindustries.com/#sle.
   2. Karona, Inc; ____: www.karonadoor.com/#sle.
   3. Maiman Company; ____: www.maiman.com/#sle.
   4. Marshfield DoorSystems, Inc; _____: www.marshfielddoors.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS

A. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.

B. Exterior Doors: 1-3/4 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints; water repellent treated. Transparent finish as indicated on drawings.

C. Interior Doors: 1-3/8 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints. Transparent or opaque finish as indicated on drawings.

D. Wood veneer facing with factory transparent finish as indicated on drawings.

E. Wood veneer facing with factory opaque finish as indicated on drawings.

2.03 DOOR AND PANEL FACINGS

A. Veneer Facing for Transparent Finish: Natural Birch, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Transom Panels: Continuous match to door.
   2. Pairs: Pair match each pair; set match pairs within 10 feet of each other when doors are closed.

B. Adhesive: Type I - Waterproof.

2.04 DOOR CONSTRUCTION

A. Vertical Exposed Edge of Stiles: Of same species as veneer facing.

B. Fit door edge trim to edge of stiles after applying veneer facing.

C. Bond edge banding to cores.

D. Panels: Flat.

E. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

G. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

H. Fire Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.05 FACTORY FINISHING

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
   2. Opaque:
      a. Color: As selected by Architect.

B. Factory finish doors in accordance with approved sample.

C. Seal door top edge with color sealer to match door facing.

2.06 ACCESSORIES

A. Wood Door Frames: As specified in Section 06 20 00.

B. Hollow Metal Door Frames: As specified in Section 08 11 13.

C. Glazed Openings:

D. Door Hardware: As specified in Section 08 71 00.

E. Wood Louvers: Wood, of same species as door facing, oval style, and at least __ percent louver free area.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standards.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.
   2. Install smoke and draft control doors in accordance with NFPA 105 requirements.
   3. Install exterior doors in accordance with ASTM E2112.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Field-Finished Doors: Trimming to fit is acceptable.
   1. Adjust width of non-rated doors by cutting equally on both jamb edges.
   2. Trim door height by cutting bottom edges to a maximum of 3/4 inch.
   3. Trim fire-rated doors in strict compliance with fire rating limitations.

D. Machine cut for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

3.03 TOLERANCES

A. Comply with specified quality standard for fit, clearance, and joinery tolerances.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

DIVISION 08 16 13
FIBER CLASSIC FIBERGLASS ENTRY DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiberglass Entry Doors
B. Impact Resistant Fiberglass Entry Doors
C. Fire Rated Fiberglass Entry Doors

1.2 RELATED SECTIONS

A. 07 25 00 – Weather Barriers
B. 07 27 20 – Vapor Permiable Fluid Applied Air Barriers
C. 07 92 00 – Joint Sealants: Sealants and caulking
D. 08 80 00 - Glazing
E. 08 71 00 – Door Hardwar
F. 09 91 13 – Exterior Painting
G. 09 91 23 – Interior Painting

1.3 REFERENCES

A. Fenestration and Glazing Industry Alliance (formally American Architectural Manufacturers)
   1. AAMA/WDMA/CSA 101/I.S. 2 / A440-17 North American Fenestration Standard/Specification for Windows, Doors, and Skylights.
   2. AAMA/WDMA/CSA 101/I.S. 2 / A440-11 North American Fenestration Standard/Specification for Windows, Doors, and Skylights.
   3. AAMA/WDMA/CSA 101/I.S. 2 / A440-08 North American Fenestration Standard/Specification for Windows, Doors, and Skylights.
   4. AAMA 920 – Specifications for Operating Cycle Performance of Active Side Hinged Exterior Door Slabs.
   5. AAMA 925 – Specification for Determining the Vertical Loading Resistance of Side Hinged Door Systems.
   6. AAMA 1304 – Voluntary Specification for Determining Forced Entry Resistance of Side Hinged Door Systems.
   7. AAMA 1702.2 – Voluntary Standard for Utilization in Manufactured Housing for Swinging Exterior Passage Doors.
B. American National Standards Institute
   1. ANSI/BHMA A156.2 – Performance Standard for Bored and Preassembled Locks and Latches.
C. American Society for Testing and Materials (ASTM):
   1. ASTM E 90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
   2. ASTM E 283 – Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
   3. ASTM E 330 – Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
   4. ASTM E 331 – Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
   6. ASTM E 547 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
   7. ASTM E 987 – Standard Test Methods for Deglazing Force of Fenestration Products.
   8. ASTM E 1300 – Standard Practice for Determining Load Resistance of Glass in Buildings.

9. ASTM E 1332 – Standard Classification for Determination of Outdoor-Indoor Transmission Class.
10. ASTM E 1886-19 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
11. ASTM E 1996-17 – Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
12. ASTM E 2235 – Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods.

D. Environmental Protection Agency and Department of Energy:
1. Energy Star Program Requirements Product Specification for Residential Windows, Doors, and Skylights.

F. Housing & Urban Development
1. HUD UM89 – HUD Building Product Standards and Certification Program for Exterior Insulated Steel Door Systems.

G. National Fire Protection Association
1. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies

H. Underwriters Laboratory
1. UL 10B – Standard for Fire Testing Door Assemblies.
2. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies.

1.4 PERFORMANCE REQUIREMENTS

A. Door Unit Air Leakage, NFRC 400, 1.57 psf (25 mph): 0.50 cfm per square foot of frame or less.
B. Door Unit Water Penetration: No water penetration through door unit when tested in accordance with ASTM E 331or ASTM E 547 with water applied at rate of 5 gallons per hour per square foot at 0 psf.
C. Doors shall qualify for Energy Star Rating.

1.5 SUBMITTALS

A. Refer to Division 01 30 00 Submittal Procedures
B. Product Data: Submit door manufacturer current product literature, including installation instructions.
C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections, anchorage methods and locations, accessories, hardware locations, and installation details.
D. Samples: Submit full-size or partial full-size verification sample of door illustrating glazing system, quality of construction, texture, and color of finish.

1.6 QUALITY ASSURANCE

A. Mockup:
1. Provide sample unit of representative product size and using manufacturer approved installation methods to determine acceptability of door installation methods. Comply with Division 01 43 39 Quality Assurance
2. Approved mockup shall represent minimum quality required for the Work.
3. Approved mockup shall [not] remain in place within the Work.

C. Quality Assurance Submittals:
1. Provide documentation for specified performance as required.
2. Manufacturers' installation instructions.

D. Manufacturer Qualifications: Manufacturer shall have successful experience in producing the type of product required for project applications equivalent to the requirements for this project.

E. Installer Qualifications:
1. [Optional: Installer holds current credential as a Therma-Tru® Certified Installer.]

1.7 DELIVERY, STORAGE, AND HANDLING

A. Refer to Division 01 60 00 Product Requirements.
B. Delivery: Deliver materials to site undamaged with labels clearly identifying manufacturer, product name, and installation instructions
C. Storage: Store materials in an upright position, off ground, under cover, and protected from weather, direct sunlight, and construction activities.
D. Handling: protect materials and finish during handling and installation to prevent damage.

1.8 WARRANTY

A. Submit manufacturer warranty and ensure that forms have been completed in KCDC's name and registered with manufacturer; include detailed terms of warranty.

B. Therma-Tru® standard limited warranty for fiberglass Therma-Tru® Door Product and genuine Therma-Tru® components, including TRU-GUARD™ Composite rot-resistant frames, mullions, and brickmould sourced from Therma-Tru (excluding primed pine door frames and oak door frames, and non-rot resistant mullions and brickmould) used in commercial and multi-residential projects will be free from material and workmanship defects for a period of three years subject to certain limitations and restrictions. For complete details and current warranty information go to www.thermatru.com.

C. PrismaGuard™ Limited Warranty Rider provides coverage to the Warranty Holder for non-conformities in select stain and paint finishes available through certain distributors of the door slab, sidelite, transom, and other genuine Therma-Tru components of a Therma-Tru fiberglass door system. For complete details and current warranty information go to www.thermatru.com.

1.9 MAINTENANCE MATERIALS:

A. Furnish the following for KCDC's use in maintenance of project.
Provide Two extra doors from same production run as products installed.
Package products with protective coverings and identify with descriptive labels. Ensure doors are not damaged prior to handing over to KCDC's use.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of design:
Therma-Tru Corp.
1750 Indian Wood Circle
Maumee, OH 43537
(419) 891-7400
(800) 843-7628
www.thermatru.com
Contact:
Rod Clark
458-206-8532
rclark@thermatru.com

B. Substitutions: Not permitted

C. Requests for substitutions will be considered in accordance with provisions of Division 01 60 00.

2.2 FIBERGLASS ENTRY DOORS

A. Fiberglass Entry Doors: All fiberglass doors manufactured by Therma-Tru®. Specification is for complete entry systems with components manufactured by Therma-Tru® and assembled by independent fabricators.

1. Select [Fiber-Classic®],[20 Min Fire Door]

2. Construction:

a. Fiber-Classic®
1/16-inch minimum thickness, proprietary fiberglass-reinforced thermoset composite, wood-grained in natural hardwood patterns, stainable and paintable. Door edges are machinable kiln-dried pine, primed, lock edge reinforced with engineered lumber core, lockset area reinforced with solid blocking for hardware backup. Door bottom edge is moisture- and decay-resistant composite. Core is foamed-in-place polyurethane, density 1.9 pcf minimum.

b. 20 Min Fire Door
Foam based proprietary 20-minute core.

3. Door Style

a. Fiber-Classic®
1. Refer to drawings for style.

B. Frames: Provided and assembled by third party fabricators to exacting specifications from Therma-Tru to help maximize system performance. Therma-Tru® strongly recommends the use of TRU-GUARD™ composite rot-resistant frames, mullions, and brickmould sourced from Therma-Tru. However, the use of a non-Therma-Tru® frame system (or a Therma-Tru Primed Pine Frame or Therma-Tru Oak Frame) will not automatically void the entire limited warranty. Refer to 1.8.B for clarification.
1. TRU-GUARD™ Rot Resistant – frames, mullions, and brickmould sourced through Therma-Tru (To be selected by architect)
2. Pine Frame Milled from 5/4 kiln-dried material with profiled ½” stop and 6-degree sill gain prep.
3. Jamb Width [Standard 4 9/16”] Optional: [5 ¼”] [6 9/16”]. Coordinate with wall type for width of jamb.

C. Sills
1. Inswing: [Composite Adjustable]
2. Outswing: [Composite Outswing]
3. Other: [Public Access Sill]
4. Finish: To be selected by architect

2.3 HARDWARE

A. Hinges: Steel 4 x 4 x 0.098 inches finished to match hardware, plated screws to match.
Finish to be selected by architect
1. Adjustable
2. Self-Aligning Ball Bearing
3. Self-Aligning
4. Self-Aligning NRP
5. Security Tab
6. Spring Loaded

B. Adjustable Security Strike Plate (for latch and deadbolt)

C. Locking Hardware:
   1. Coordinate hardware requirements with Hardware Division for I-Core locks.

2.4 GLAZING
   1. Therma-Tru factory glazed with [double-pane]

2.5 INSTALLATION ACCESSORIES
A. Sill pan
B. Corner seal pad
C. Rain deflector
D. Rain Guard
E. Sill Cover

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive doors. Notify Architect in writing any unacceptable conditions that would adversely affect installation or subsequent performance of the product. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install fiberglass doors in full compliance with Therma-Tru® written instructions and approved shop drawings.

B. Install 20 minute doors with permanent fire door certification label in compliance with the requirements of the labeling agency and NFPA.

C. Maintain alignment and compatibility with adjacent work.

3.3 FINISHING

A. Finish in compliance with Therma-Tru® written recommendations. Guidance for proper finishing is available at www.thermatru.com – "Recommendations for Proper Finishing and Painting or Staining."

B. Pre-Finish - *PrismaGuard*™ proprietary finish professionally applied in a controlled environment for enhanced durability - **Stain** [to be selected by architect)

Paint [to be selected by architect)

3.3 Protection

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products prior to Substantial Completion in accordance with Therma-Tru written recommendations. Guidance for proper finishing is available at www.thermatru.com – "Recommendations for Proper Finishing and Painting or Staining."

END OF SECTION

SECTION 08 31 00

ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling mounted access units.

1.02 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting: Field paint finish.

B. Section 09 91 23 - Interior Painting: Field paint finish.

C. Section 23 33 00 - Air Duct Accessories: Access doors in ductwork.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. FM (AG) - FM Approval Guide; current edition.

D. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

E. Project Record Documents: Record actual locations of each access unit.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units with Return Air Grille:
   1. Location: As indicated on drawings.
   2. Panel Material: Aluminum extrusions with gypsum board inlay.
   3. Size: 12 inch by 12 inch or as indicated on drawings to access plumbing and mechanical.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   7. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

B. Wall-Mounted Units in Wet Areas:
   1. Location: As indicated on drawings.
   2. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   3. Size: 12 inch by 12 inch.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.

6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

C. Fire-Rated Wall-Mounted Units:
1. Location: As indicated on drawings.
2. Wall Fire-Rating: As indicated on drawings.
3. Panel Material: Steel.
4. Size: 12 inch by 12 inch.
5. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

D. Ceiling-Mounted Units with Return Air Grille:
1. Location: As indicated on drawings.
2. Panel Material: Aluminum extrusion with gypsum board inlay.
3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
4. Size - Other Ceilings: 12 inch by 12 inch.

E. Fire-Rated Ceiling-Mounted Units:
1. Location: As indicated on drawings.
2. Ceiling Fire-Rating: As indicated on drawings.
3. Panel Material: Steel.
4. Size: 12 inch by 12 inch.
5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL AND CEILING MOUNTED ACCESS UNITS

A. Manufacturers:
1. Activar Construction Products Group - JL Industries; _____: www.activarcpg.com/#sle.
2. ACUDOR Products Inc: www.acudor.com/#sle.
3. Babcock-Davis; _____: www.babcockdavis.com/#sle.
4. Bauco Access Panel Solutions Inc: www.accesspanelsolutions.com/#sle.
5. Cendrex, Inc: www.cendrex.com/#sle.
6. Karp Associates, Inc; ____: www.karpinc.com/#sle.
7. Milcor, Inc; ____: www.milcorinc.com/#sle.
8. Nystrom, Inc; _____: www.nystrom.com/#sle.
9. Studco Building Systems; EZConcept AccessDor: www.studcosystems.com/#sle.
10. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 WALL AND CEILING MOUNTED ACCESS UNITS WITH RETURN AIR GRILLES

A. Gypsum Board Inlay Access Panels: Provide rectangular and square access panel with recessed and gasketed aluminum perimeter frame that acts as finishing edge and having concealed mechanical touch-latch with safety cable and free-pivoting hinge.
1. Rectangular Panel Frame Size: 24 by 36 inch set within 1/2 inch thick gypsum board.
2. Square Panel Frame Size: 24 by 24 inch set within 1/2 inch thick gypsum board.
3. Panel Frame: 1 inch margin with concealed countersunk screw mounting.

B. Air Return Grille: Linear bar grille fitted with flush and concealed perimeter frame.
1. Grille: Fixed grilles with 1/4 inch thick by 5/8 inch deep bars at 1/2 inch on center providing 48 percent free space opening.
2. Grille Size: 12 by 12 inch set within 1/2 inch thick gypsum board.
3. Fabrication: Aluminum with factory powder coated finish.
4. Grille Frame: 1 inch margin with concealed countersunk screw mounting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1- GENERAL

1.1 SECTION INCLUDES

A. Manual disappearing stairways.

1.2 REFERENCES

A. ANSI A14.9: Safety Requirements for Ceiling Mounted Disappearing Climbing Systems.

1.3 SUBMITTALS

A. Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

B. Shop Drawings for Stairs:
1. Plan and section of stair installation.
2. Indicate rough opening dimensions for ceiling and/or roof openings.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store stairway until installation inside under cover in manufacturer's unopened packaging. If stored outside, under a tarp or suitable cover.

1.5 WARRANTY

A. Limited Warranty: One year against defective material and workmanship, covering parts only. Defective parts, as deemed by the manufacturer, will be replaced at no charge, freight excluded, upon inspection at manufacturer's plant.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Precision Ladders, LLC, P. O. Box 2279; Morristown, TN 37816-2279; Tel: 423-586-2265; Fax: 423-586-2091; www.PrecisionLadders.com

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 MANUAL DISAPPEARING STAIRWAY.

A. Manual Disappearing Stairway.
1. Standard Model: Super Simplex Disappearing Stairway as manufactured by Precision Ladders LLC. Stairs for ceiling heights 7’-0” – 12’-0”: Model 1000 (ceiling height in inches). Stairs for ceiling heights 12’-1” – 13’-6”: Model 2000 (ceiling height in inches).

B. Performance Standard: Unit shall comply with ANSI A14.9, Commercial Type, for rough openings between 27 inches to 39 inches. Residential Type for rough openings between 22-1/2” and 27”. Stairway capacity shall be rated at 500 lbs.

C. Accessories:

1. Steel pole to aid opening and closing stairways.
2. Stairs for ceiling heights 9’ -10” – 12’ -0” shall be equipped with a patented Precision Fold Assist to aid in folding and unfolding of sections. Stairs for ceiling heights 12’ 1” – 13’6” shall be equipped with 2 Fold Assists. Precision Fold-Assist is optional on stairways for ceiling heights of 9’ 9” and below.
3. Keyed lock for door (standard on fire-rated models, optional on non-fire-rated models).

D. Components:

1. Ceiling Opening
   a. Ceiling height of 9’ 9” or less requires an opening of 30” x 54”
   b. Ceiling heights from 9’ 10” – 12’ 0” require opening of 30” x 64”
   c. Ceiling heights from 12’ 1” – 13’ 6” require opening of 22 ½” x 72”
2. Stairway Stringer: 6005-T5 Extruded aluminum channel 5” x 1” x 1/8”; tri-fold design; steel blade type hinges; adjustable feet with plastic Mar-guard. Pitch shall be 63°.
3. Stairway Tread: 6005-T5 extruded aluminum channel 5 3/16 inches by 1 1/4 inches by 1/8 inch. Depth is 5 3/16 inches. Deeply serrated top surface. Riser Height: 9-1/2 inches. Clear Tread Width for Standard Width: 18 inches.
4. Railing: Aluminum bar handrail riveted to stringers, upper section only.
5. Frame:
   a. If ceiling to floor (or roof deck) above is under 12”, frame shall be 1/8” steel formed channel, box.
   b. When ceiling to floor (or roof deck) above is 12” or greater, the frame shall be 1/8” steel, 63° (with built-in steps) on the hinge end, 90° on the other end, custom depth to fill distance from ceiling to floor above. This custom frame will require a longer opening in the floor above than is required at the ceiling level.
6. Door Panel
   a. Standard (non-fire rated) door shall be constructed of 1/8 inch (3 mm) aluminum sheet attached to stairway frame with a steel piano hinge. Door overlaps bottom flange of frame. Eye bolt accommodates pole for opening and closing door.
   b. On fire-rated models, the door panel shall be constructed of 20 gauge steel and have a 2 hour fire rating for use in fire-rated ceiling assemblies as issued by Warnock-Hersey or other appropriate independent testing/licensing agency.
7. Hardware:
   a. Steel blade type hinge connecting stringer sections. Zinc plated and chromate sealed.
   b. Steel operating arms, both sides. Zinc coat with clear trivalent chromate.
   c. Double acting steel springs and cable, both sides.
   d. Rivets rated at 1100 lb (499 kg) shear strength each.
   e. Steel section alignment clips at stringer section joints.
   f. Molded rubber guards at corners of aluminum door panel.
8. Finishes: Mill finish on aluminum stairway components. Prime coat on frame.

2.3 FABRICATION

A. Completely fabricate ladder ready for installation before shipment to the site.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until rough opening and structural support have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08 33 23
OVERHEAD DOOR

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. High-speed roll-up doors.

B. Wiring from electric circuit disconnect to operator to control station.

1.02 RELATED SECTIONS

A. None

1.03 REFERENCES

A. NEMA - National Electrical Manufacturers Association.

B. LED - Light Emitting Diode.

1.04 SYSTEM DESCRIPTION

A. Motor type: AC drive, and variable speed with soft acceleration and braking. Mechanical release lever on side column allows door to be easily opened in the event of a power failure.

1.05 SUBMITTALS

A. Submit the following:

1. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
2. Product Data: Provide general construction, component connections and details, and electrical equipment, operation instructions, and information.
3. Samples: Submit samples of door slat material.
4. Manufacturer's Installation: Indicate installation sequence and procedures, adjustment, and alignment procedures.

1.06 MAINTENANCE DATA

A. Scheduled maintenance program available to include lubrication requirements and frequency, periodic adjustments required, scheduled maintenance suggested, manufacturer’s data sheets, and equipment inter-connection diagrams.

1.07 REGULATORY REQUIREMENTS

A. Electrical components UL listed.

B. Electrical control panel NEMA approved.

1.08 QUALITY ASSURANCE

A. Furnish high-speed roll doors and all components and accessories by one manufacturer.

B. Specific door model used must have a proven track record of successful installations in similar applications of no less than 3 years. References to be provided upon request.

1.09 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on shop drawings.

1.10 COORDINATION

A. Coordinate the work with installation of electric power and locations and sizes of conduit.

1.01 WARRANTY

A. Five-year limited warranty on mechanical components, including motor assembly

B. Two-year limited warranty on electrical components

C. Two-year limited warranty on standard door panels, rollers, hinges and door tracks

PART 2 - PRODUCTS

2.01 PRODUCTS

A. Rytec Corporation Spiral LH door.

2.02 MATERIALS

A. Door Panel: Double-walled, aluminum slats are 6 inches high by 1-3/16 inches thick. Integral rubber weatherseal between each of the panels. Door slats to be connected by hinge system to provide additional rigidity, support and security to door curtain. Door curtain does not require a tensioning system for additional wind/pressure resistance. Doors which require the use of a tensioning system for additional wind/pressure resistance will not be accepted. Fully ventilated slat

B. Side Frames: Powder coated steel side frames with full height weatherseal on both sides to seal against door panel. “Intelligent” Advanced^3 Light Curtain System mounted directly in door line (to 6’0” above finished floor). Doors using an external coil cord will not be accepted.

C. Bottom Bar: Extruded aluminum bottom bar with electric, reversing edge that reverses the door upon contacting an object.

D. Counterbalance: Up to six extension springs in each side column, depending on the size of the door. Springs assist the motor in opening the door. Mechanical release lever on side column allows door to be easily opened in the event of a power failure. Doors using torsion springs for counterbalance or doors with springs located within a barrel will not be accepted.

E. Drive system: Minimum 2 HP motor with variable speed AC drive which allows for soft acceleration and braking. Doors using a motor with a clutch or pump will not be accepted.

F. Travel Speed: Adjustable, through control box, and factory-set to open at 60 inches per second and close at 24 inches per second.

G. Electrical Controls

1. Rytec controller housed in a UL/cUL Listed NEMA 4X-rated enclosure with factory set parameters.
2. Parameter changes and all door configurations can be made from the face of the control box, no exposure to high voltage. Control panels that require opening of the control box and reaching inside to make parameter changes will not be accepted.
3. Controls include a variable speed AC drive system capable of infinitely variable speed control in both directions.
4. Programmable inputs and outputs accommodate special control applications (traffic lights, horns, actuation devices, timing sequences, etc.) without the need for additional electrical components.

5. Self-diagnostic scrolling two-line vacuum fluorescent display provides expanded informational messages for straightforward installation, control adjustments and error reporting.
6. All errors have a time and date stamp for reference.

H. Door to use rotary encoder to regulate door travel limits. Limits to be adjustable, without the use of tools, from floor level at the control panel. Doors using mechanical limits switches or doors that require tools to set the limits will not be accepted.

I. Door Track: Spiral LH track design features no metal-to-metal contact which results in ultra-quiet, low maintenance operation and eliminates wear on panel slats. Overhead tracks roll back and travel horizontally to accommodate limited headroom of as little as
10". Doors that roll up on a barrel or whose track design allows metal-to-metal contact will not be accepted.

J. Wind load: Door testing indicates the door is capable of withstanding winds up to 127 mph (20 psf).

K. Required Maintenance: No lubrication of any kind required anywhere on the door or its components. Minimum estimated life expectancy of any component on door to be no less than approximately 200,000 cycles.

L. All access control by others

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances, and conditions are acceptable.

3.02 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Fit and align assembly including hardware; level to plumb to provide smooth operation.

D. Coordinate installation of electrical service. Complete wiring from disconnect to unit components.

3.03 ADJUSTING

A. Adjust door and operating assemblies.

B. Test and adjust door(s), if necessary, for proper operation.

3.04 CLEANING

A. Clean door and components.

END OF SECTION

SECTION 08 43 13

ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

D. Door hardware.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Steel attachment members.

B. Section 05 50 00 - Metal Fabrications: Steel attachment devices.

C. Section 07 25 00 - Weather Barriers: Sealing framing to weather barrier installed on adjacent construction.

D. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

E. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

F. Section 08 80 00 - Glazing: Glass and glazing accessories.

G. Section 09 91 23 - Interior Painting: Field painting of interior surface of infill panels.

H. Section 12 21 13 - Horizontal Louver Blinds: Attachments to framing members.

I. Section 12 24 00 - Window Shades: Attachments to framing members.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

F. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

G. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 4 inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in KCDC's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Tennessee.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts Manufacturers:
   1. Coral Architectural Products, a division of Coral Industries, Inc; _____: www.coralap.com/#sle.
   2. C.R. Laurence Company, Inc; U.S. Aluminum; _____: www.crl-arch.com/#sle.
   3. Kawneer North America; _____: www.kawneer.com/#sle.
   4. Manko Window Systems, Inc; _____: www.mankowindows.com/#sle.
   5. Oldcastle BuildingEnvelope; _____: www.oldcastlebe.com/#sle.
   6. Tubelite, Inc; _____: www.tubeliteinc.com/#sle.
   7. Trulite Glass & Aluminum Solutions, LLC; _____: www.trulite.com/#sle.
   8. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1 inch insulating glazing.
   2. Glazing Position: Centered (front to back).
   3. Vertical Mullion Dimensions: varies. refer to drawings for depth of mullions.
   4. Finish: to be selected by architect.

a. Factory finish all surfaces that will be exposed in completed assemblies.
b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

5. Finish Color: As selected by Architect from manufacturer's standard line.
6. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
7. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
8. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
9. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
10. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
11. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements:
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Glazing Stops: Flush.

B. Glazing: As specified in Section 08 80 00.

C. Swing Doors: Glazed aluminum.
1. Thickness: 1-3/4 inches.
2. Finish: Same as storefront.

D. Interior Sliding Storefront Doors: Full glazed extruded aluminum frame and operable panels; manual operation; bottom rollers; flat or recessed sill.
1. Configuration and Size: As indicated on drawings.
2. Glazing Thickness: 1/4 inch.
3. Stile Width: 2 inches.
4. Frame Face Width: 1-1/2 inches.
5. Provide deadlock keyed both sides on each operable panel.
6. Manufacturers:
a. C.R. Laurence Company, Inc; U.S. Aluminum; Series 2000 Mall Sliding Door: www.crl-arch.com/#sle.
b. Trulite Glass & Aluminum Solutions, LLC; _____: www.trulite.com/#sle.
c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.05 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.

2.06 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: Storefront manufacturer's standard type to suit application.
   1. Finish on Hand-Contacted Items: Selected by architect.
   2. For each door, include butt hinges, pivots, push handle, pull handle, exit device, narrow stile handle latch, and closer.

C. Automatic Door Operators and Actuators: Coordinate installation as required per drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Install hardware using templates provided.

K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

Section 08 54 13
Essential Casement/Awning Window

Part 1 General

Section Includes

A. Essential® Casement/Awning window complete with hardware, glazing, mulling options including PTAC, weather strip, insect screen, grilles-between-the-glass, jamb extension, sheet rock return, j-channel, and standard or specified anchors, trim and attachments

Related Sections

A. Submittal Procedures: Shop Drawings, Product Data and Samples
B. Millwork: Wood trim other than furnished by window manufacturer
C. Joint Sealants: Sill sealant and perimeter caulking
D. Paints and Coatings: Paint and stain other than factory-applied finish

References

A. American Society for Testing and Materials (ASTM):

1. C1036: Standard Specification for Flat Glass.

2. E90-09: Standard Test Method for Laboratory Measurement of airborne Sound Transmission Loss of Building Partitions and Elements.

3. E 283: Standard Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.

4. E 330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Door by Uniform Static Air Pressure Difference.

5. E 547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.

6. E 2190: Standard Specification for Insulating Glass Unit Performance Evaluation.

7. F 2090-10: Standard Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms.

B. Insulating Glass Manufacturer's Alliance/Insulating Glass Certification Council (IGMA/IGCC).
C. American Architectural Manufacturer's Association/Window and Door Manufacturer's Association/Canadian Standards Association (AAMA/WDMA/CSA): (use appropriate specifications depending on certification for each product type).

1. AAMA/WDMA/CSA 101/I.S.2/A440-11: North American Fenestration Standard/Specification for windows, doors, and skylights.

2. AAMA/WDMA/CSA 101/I.S.2/A440-17: North American Fenestration Standard/Specification for windows, doors, and skylights.

3. AAMA 450-10: Voluntary Performance Rating Method for Mulled Fenestration Assemblies

D. Window and Door Manufacturer's Association (WDMA): Hallmark Certification Program.
E. American Architectural Manufacturer's Association (AAMA): 624-10: Voluntary Specification, Performance Requirements and Test Procedures for Organic Coatings on Fiber Reinforced Thermoset Profiles.
F. National Fenestration Rating Council (NFRC): 101: Procedures for Determining Fenestration Product Thermal Properties.

System Description

A. Design and Performance Requirements:

Product	Air Tested to psf	Water Tested to psf	Design Pressure (DP)	Certification Rating	Max Overall Width		Max Overall Height	
					in	mm	in	mm
Essential Casement	1.57	6	40	LC-PG40-C	27	(686)	71	(1803)
Essential Casement	1.57	6	40	LC-PG40-C	35	(889)	34	(864)
Essential Casement	1.57	6	40	LC-PG40-C	35	(889)	54	(1372)
Essential Casement	1.57	6	40	LC-PG40-C	35	(889)	71	(1803)
Essential Awning	1.57	6	40	LC-PG40-AP	48	(1219)	35	(889)
Essential Casement Picture	1.57	6	40	LC-PG40-FW	71	(1803)	71	(1803)

Submittals

A. Shop Drawings: Submit shop drawings under provision of Section 01 33 23.

B. Product Data: Submit catalog data under provision of Section 01 33 23.

C. Samples:

1. Submit corner section under provision of section 01 33 23.

2. Specified performance and design requirements under provisions of Section 01 33 23.

D. Quality Control Submittals: Certificates: submit manufacturer's certification indicating compliance with specified performance and design requirement under provision of section 01 33 23.

Quality Assurance

A. Requirements: consult local code for IBC [International Building Code] and IRC [International Residential Code] adoption year and pertinent revisions for information on:

3. Egress, emergency escape and rescue requirements.

4. Basement window requirements.

5. Windows fall prevention and/or window opening control device requirements.

Delivery

A. Comply with provisions of Section 01 65 00.
B. Deliver in original packaging and protect from weather.

Storage and Handling

A. Store window units in an upright position in a clean and dry storage area above ground to protect from weather under provision of Section 01 66 00.

Warranty

The following limited warranty is subject to conditions and exclusions. There are certain conditions or applications over which Marvin has no control. Defect or problems as a result of such conditions or applications are not the responsibility of Marvin. For a more complete description of the Marvin limited warranty, refer to the complete and current warranty information is available at http://www.marvin.com/support/warranty.

A. Clear insulating glass with stainless steel spacers is warranted against seal failure caused by manufacturing defects and resulting in visible obstruction through the glass for twenty (20) years from the original date of purchase. Glass is warranted against stress cracks caused by manufacturing defects from ten (10) years from the original date of purchase.
B. Hardware and other non-glass components are warranted to be free from manufacturing defects for ten (10) years from the original date of purchase.

Part 2 Products

Manufactured Units

A. Basis of Design: Description: Essential® Casement/Awning and related stationary or picture units as manufactured by Marvin Windows and Doors, Roanoke, Virginia.

Frame Description

A. Interior:

1. Pultruded reinforced fiberglass (Ultrex®), 0.075”-0.077” (2mm) thick wall.
2. Frame depth: 3 3/32” (79mm).
3. Jamb Depth: 2” (51mm)
4. Frame Expander accessory is an insert kit shipped as ready-to-install.
5. Insert kit includes four fabricated frame expander components, including head-jamb, sill and both jamb components.
6. Included in both 1” and 3” frame expander options.

Sash Description

A. Pultruded reinforced fiberglass (Ultrex®), 0.075”-0.077” (2mm) thick wall.
B. Composite sash thickness: 15/16” (24mm)

Glazing

A. Select quality complying with ASTM C 1036. Insulating glass SIGMA/IGCC when tested in accordance with ASTM E 2190. STC/OITC ratings are tested to the stated performance level in accordance with ASTM E 90-09.
B. Glazing Method: 11/16” (17mm) insulating glass.
C. Glass Type: Low E1, E2, E3, or E3/ERS with air or Argon Gas.
D. Glass Type Options: Obscure Glass or California Fire Glass (Annealed exterior and tempered interior glazing configuration), Rain Glass, Glue Chip, Narrow Reed, Reed, Frost, Bronze Tint, Gray Tint, Green Tint.
E. Glazing Seal: Silicone bead at exterior; interior has glazing boot inserted.
F. Perimeter Spacer: Default color is mill finish (stainless). An optional black perimeter spacer color is available for all interior color selections.
G. Glazing Option: STC/OITC upgrade.

Mulling

Standard Mulling

A. Directional mull limits: 6 wide by 1 unit high; Rough Opening not to exceed 114” x 78” (2896mm x 1981mm).
B. Directional mull limits: 5 units wide by 5 units high: Rough Opening not to exceed 96” x 96” (2438mm x 2438mm).

Reinforced Mulling

A. Directional mull limits: 6 wide by 1 unit high; Rough Opening not to exceed 114” x 78” (2896mm x 1981mm).
B. Directional mull limits: 5 units wide by 5 units high: Rough Opening not to exceed 96” x 96” (2438mm x 2438mm).

2.6 Packaged Terminal Air Conditioner (PTAC) Mulling

A. Essential Casement frame profile for use with PTAC; Factory-mulled below an Essential Casement Picture Unit.
B. Mull configuration: 1 wide by 2 high; maximum Rough Opening 72” x 96” (1829mm x 2438mm).
C. Essential Casement Picture sizes to be standard sizes only.

    1. Width Call Number: 40, 50, and 60.

    2. Height Call Number: 40, 46, 50, 56, and 60.
D. PTAC and mulled assembly currently non-rated; non-certified for air, water and structure.
E. Height of PTAC window frame will accommodate all PTAC sizes.

    1. Standard PTAC height: 19 1/4”; standard PTAC width to match upper unit width.
F. Color

    1. Exterior: Stone White, Cashmere, Pebble Gray, Bronze, Evergreen, or Ebony.

    2. Interior: Stone White, Bronze or Ebony (split finishes not available on Bronze and Ebony interior options)
G. PTAC grill/louver not ordered, stocked or installed by Marvin Windows and Doors.

    1. Reliable Products Inc. is recommended as manufacturer – color match, fit, form, and functionality.
H. Maintain all current product attribute options except the following:

    1. Interior accessories: sheetrock return, ¾” receiver, jamb extension (all depths), and frame filler not available factory installed.

    2. Exterior accessories: Flush fin not available.

Finish

A. Exterior: Pultruded fiberglass

    1. Factory baked on acrylic urethane.

    2. Meets AAMA 624-10 requirements.
B. Interior: Pultruded fiberglass

    1. Factory baked on acrylic urethane.
C. Color: Stone White exterior with Stone White interior, Pebble Gray exterior with Stone White interior, Bronze exterior with Stone White interior, Evergreen exterior with Stone White interior, Cashmere exterior with Stone White interior, Ebony exterior with Stone White interior. Bronze exterior with Bronze interior, Ebony exterior with Ebony interior. (Split finishes not available on Dark Interior options)

Hardware

A. Lock: Multipoint locking mechanism is actuated from a single point of operation. The lock mechanism is concealed with only the actuator handle and escutcheon being visible to the interior.
B. Hinges: Concealed stainless steel track and injection molded shoe.
C. Handle: Die cast detachable folding handle.

D. Roto-gear Operator: E-Gard™ coated hinge arm and housing mechanism.
E. Snubber: Pulls the sash tight to the frame and provides engagement to keep the sash in place under structural loads.
F. Color: Applies to handle and locking hardware:

1. Standard Color: Stone White on Stone White Interior, Oil Rubbed Bronze on Bronze interior, Matte Black on Ebony Interior.

2. Optional Colors: Stone White, Almond Frost, Oil Rubbed Bronze, Satin Nickel, Bright Brass, Matte Black

Optional Hardware

A. Coastal hardware is available.
B. Casement Window Opening Control Device – Factory applied.

1. Minimum frame OSM: 18 9/16” x 23 ½” (471mm x 597mm); Maximum frame OSM: 35 ½” x 71 ½” (902mm x 1816mm).

G. WOCD locking assembly: Die cast. Color: White, Almond Frost, Oil Rubbed Bronze, Matte Black.
H. WOCD tether assembly: glass filled nylon. Color: E-Guard™ color match.
C. Awning Limiter Device: Factory or Field applied.

1. Limiter Clip: Tumbled stainless steel.

Weather Strip

A. Primary weather strip is an extruded TPE foam filled bulb attached to all four sides of the frame by a kerf and provides seal between sash and frame.
B. Secondary weather strip is an extruded TPE hollow bulb that attaches to a kerf in the sash and provides seal between sash and frame.
C. Standard weather strip color: black.

Jamb Extension

A. Standard: 2” (51mm) jambs. Optional factory-installed jamb extension: 4 9/16” (116m) and 6 9/16” (167mm).
B. Available in Stone White, Bronze or Ebony. Default color will match the unit interior selection.
    1. Split finishes are not available for Dark Interior options.
    2. Stone White jamb extension is available for all interior color selections.

Insect Screen (Remove for fixed windows)

A. Factory-installed screen

1. Screen mesh, 18 by 16: Charcoal fiberglass.

B. Aluminum frame finish: Stone White, Bronze, Ebony.

Grilles-Between-the–Glass (GBG)

A. Manufactured from aluminum in a 23/32” (18mm) wide contoured profile placed between the two panes of glass.

1. Colors:
    a. Interior: White. Bronze or Ebony. (Matches unit interior finish)
        A. Split finishes are not available for Ebony and Bronze interior colors
    b. Exterior: White, Pebble Gray, Bronze, Evergreen, Cashmere, or Ebony
2. Pattern:
    a. Rectangular;
    b. 9 lite Prairie cut with 4” DLO corners
    c. 6 lite top or bottom Prairie cut with 4” DLO corners
    d. 6 lite left or right Prairie cut with 4” DLO corners
    e. Cottage style up to 2H with the specified DLO height (3” min)
    f. Size limitations may apply to Prairie and Cottage lite cut availability

Accessories and Trim

A. Exterior Casing:

1. Non-integral to the unit. Fastened to the exterior wall with barb and kerf.

2. 2” (51mm) Brick Mould available as a full surround or with sill nosing.

3. 3 ½” (89mm) Flat Casing available as a full surround or with sill nosing. Also available with 1” (25mm) ranch style header and sill overhang.

4. Available colors: Stone White, Evergreen, Bronze, Pebble Gray, Cashmere, or Ebony.

B. Installation Accessories:

1. Factory-installed vinyl nailing fin/drip cap at head, sill and side jambs.

2. Installation brackets: Brackets for 4 9/16” (116mm); 6 9/16” (167mm) jambs.

3. Mullion kit: standard mullion kit for filed assembly of related units available in horizontal, vertical and 2-wide and/or 2-high configurations. Kit includes: Instruction, interior and exterior mull covers, mull plugs and brackets.

4. Sheet rock return

5. Available colors: Stone White, Bronze or Ebony. Default color will match unit interior selection. Stone White is available for all interior color selections.

6. J-channel

7. Available colors: Stone White, Pebble Gray, Cashmere, Evergreen, Bronze or Ebony

8. Flush fin

9. Available colors: Stone White, Pebble Gray, Cashmere, Evergreen, Bronze or Ebony

10. 3/4” (19mm) receiver

11. Available colors: Stone White, Bronze or Ebony. Default color will match unit interior selection. Stone White is available for all interior color selections.

12. Frame expander (1 inch or 3 inch options available)
    a. Available colors: Stone White, Pebble Gray, Cashmere, Evergreen, Bronze or Ebony.

Part 3 Execution

Examination

A. Verification of Condition: Before installation, verify openings are plumb, square and of proper dimensions as required in Section 01 71 00. Report frame defects or unsuitable conditions to the General Contractor before proceeding,
B. Acceptance of Condition: Beginning installation confirms acceptance of existing conditions.

Installation

A. Comply with Section 01 73 00.
B. Assemble and install window/door unit(s) according to manufacturer’s instruction and reviewed shop drawing.
C. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 07 92 00 Joint Sealants. Do not use expansive foam sealant.
D. Install accessory items as required.
E. Use finish nails to apply wood trim and mouldings.

Field Quality Control

A. Remove visible labels and adhesive residue according to manufacturers’ instruction
B. Unless otherwise specified, air leakage resistance tests shall be conducted at a uniform static pressure of 75 Pa (~1.57 psf). The maximum allowable rate of air leakage shall not exceed 2.3 L/sm^2 (~0.45 cfm/ft^2).
C. Unless otherwise specified, water penetration resistance testing shall be conducted per AAMA 502 and ASTM E1105 at 2/3 of the fenestration products design pressure (DP) rating using “Procedure B” – cyclic static air pressure difference. Water penetration shall be defined in accordance with the test method(s) applied.

Cleaning

A. Remove visible labels and adhesive residue according to manufacturer’s instruction.
B. Leave windows and glass in a clean condition. Final cleaning as required in Section 01 74 00.

Protecting Installed Construction

A. Comply with Section 07 76 00.
B. Protecting windows from damage by chemicals, solvents, paint or other construction operations that may cause damage.

End of Section

SECTION 08 71 00
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, hollow metal, and fiberglass doors.

B. Hardware for fire-rated doors.

C. Electrically operated and controlled hardware.

D. Thresholds.

E. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Wood door frames.

B. Section 06 41 00 - Architectural Wood Casework: Cabinet hardware.

C. Section 07 92 00 - Joint Sealants: Sealants for setting exterior door thresholds.

D. Section 08 11 13 - Hollow Metal Doors and Frames.

E. Section 08 14 33 - Stile and Rail Wood Doors.

F. Section 08 16 13 - Fiberglass Doors.

G. Section 08 32 00 - Sliding Glass Doors: Door hardware, except cylinders.

H. Section 08 33 23 - Overhead Coiling Doors: Door hardware, except cylinders.

I. Section 08 43 13 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.

J. Section 10 14 00 - Signage: Additional signage requirements.

K. Section 10 26 00 - Wall and Door Protection: Door and frame protection.

L. Section 28 10 00 - Access Control: Electronic access control devices.

M. Section 28 46 00 - Fire Detection and Alarm: Electrical connection to activate door closers.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. 36 CFP 1191 - Americans with Disabilities Ace (ADA) Accesibility Guidelines for Building Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

C. BHMA A156.1 - American National Standard for Butts and Hinges; 2016.

D. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2017.

E. BHMA A156.3 - American National Standard for Exit Devices; 2014.

F. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.

G. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks; 2014.

H. BHMA A156.6 - American National Standard for Architectural Door Trim; 2015.

I. BHMA A156.7 - American National Standard for Template Hinge Dimensions; 2016.

J. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; 2015.

K. BHMA A156.16 - American National Standard for Auxiliary Hardware; 2018.

L. BHMA A156.17 - American National Standard for Self Closing Hinges & Pivots; 2014.

M. BHMA A156.18 - American National Standard for Materials and Finishes; 2016.

N. BHMA A156.21 - American National Standard for Thresholds; 2014.

O. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems Sponsor; 2017.

P. BHMA A156.23 - American National Standard for Electromagnetic Locks; 2017.

Q. BHMA A156.25 - American National Standard for Electrified Locking Devices; 2018.

R. BHMA A156.28 - American National Standard for Recommended Practices for Mechanical Keying Systems; 2018.

S. BHMA A156.31 - American National Standard for Electric Strikes and Frame Mounted Actuators; 2013.

T. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

U. BHMA A156.115W - American National Standard for Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

V. DHI (H&S) - Sequence and Format for the Hardware Schedule; 1996.

W. DHI (KSN) - Keying Systems and Nomenclature; 1989.

X. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

Y. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.

Z. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

AA. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

AB. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

AC. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

AD. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2018.

AE. UL (DIR) - Online Certifications Directory; Current Edition.

AF. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting 10 weeks prior to commencing work of this section; attendance is required by affected installers and the following. Work to be strictley coordinated with KCDC for complience of locking systems for all hardware:
   1. Architect.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.
   5. KCDC.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Keying Requirements Meeting:
   1. Schedule meeting at project site prior to Contractor occupancy.
   2. Attendance Required:
      a. Contractor.

b. KCDC.
c. Architect.
d. Installer's Architectural Hardware Consultant (AHC).
e. Hardware Installer.

3. Agenda:
   a. Establish keying requirements.
   b. Verify locksets and locking hardware are functionally correct for project requirements.
   c. Verify that keying and programming complies with project requirements.
   d. Establish keying submittal schedule and update requirements.
4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
   a. Access control requirements.
   b. Key control system requirements.
   c. Schematic diagram of preliminary key system.
   d. Flow of traffic and extent of security required.
5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, KCDC, participants, and those affected by decisions made.
6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
   3. List groups and suffixes in proper sequence.
   4. Provide complete description for each door listed.
   5. Provide manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
   6. Include account of abbreviations and symbols used in schedule.

D. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
   2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
   3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.

E. Samples for Verification:
   1. Submit one (1) sample of hinge, latchset, lockset, closer, and _____ illustrating style, color, and finish.
   2. Return full-size samples to Contractor.
   3. Submit product description with samples.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   1. Submit manufacturer's parts lists and templates.
   2. Bitting List: List of combinations as furnished.

H. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

I. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in KCDC's name and registered with manufacturer.

J. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

K. Maintenance Materials and Tools: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Lock Cylinders: Ten for each master keyed group.
   3. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
   1. Closers: Five years, minimum.
   2. Exit Devices: Three years, minimum.
   3. Locksets and Cylinders: Three years, minimum.
   4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Hardware must be compatible with I-Core Passage Locks. Coordinate with KCDC prior to ordering locksets.
   1. Deadbolt: SO001128292005 EA SHD QDB281-619-S4-DBSB-FSK 8
   2. Passage: SO001128292003 EA STANLEY QCL230E619
   3. Strike: US15; 2-3/4" Backset ASA
   4. Charlie McCracken at Landlord Locks for I-Core products. charlie@landlorlocks.com
   5. I-Core locks to be keyed to KCDC's masterlock

B. Hardware Basis of Design to be equal to or better than: Schlage; www.schlage.com

C. Hardware Accessory Basis of Design to be equal to or better than: Best; www.bestaccess.com

D. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

E. Provide individual items of single type, of same model, and by same manufacturer.

F. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Accessibility: ADA Standards and ICC A117.1.
   3. Applicable provisions of NFPA 101.
   4. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
   5. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR) as suitable for application indicated.
   6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
   7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
   8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

G. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
   1. Refer to Section 28 10 00 for additional access control system requirements.

H. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
      a. Aluminum fasteners are not permitted.
      b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
   2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
      a. Self-drilling (Tek) type screws are not permitted.
   3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
   4. Provide wall grip inserts for hollow wall construction.
   5. Provide spacers or sex bolts with sleeves for through bolting of hollow metal doors and frames.
   6. Fire-Rated Applications: Comply with NFPA 80.
      a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
      b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 HINGES

A. Manufacturers:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Hinges: Comply with BHMA A156.1, Grade 1.
   1. Self Closing Hinges: Comply with BHMA A156.17.
   2. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
      a. Provide hinge width required to clear surrounding trim.
   3. Provide hinges on every swinging door.

4. Provide following quantity of butt hinges for each door:

2.03 FLUSH BOLTS

A. Manufacturers:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Flush Bolts: Comply with BHMA A156.16, Grade 1.
   1. Flush Bolt Throw: 3/4 inch, minimum.
   2. Provides extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
      a. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
   3. Provide dustproof floor strike for bolt into floor, except at metal thresholds.
   4. Manual Flush Bolts: Provide lever extensions for top bolt at over-sized doors.
   5. Self-Latching Flush Bolts: Automatically latch upon closing of door; manually retracted; located on inactive leaf of pair of doors.

2.04 EXIT DEVICES

A. Manufacturers:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Exit Devices: Comply with BHMA A156.3, Grade 1.
   1. Lever design to match lockset trim.
   2. Provide cylinder with cylinder dogging or locking trim.
   3. Provide exit devices properly sized for door width and height.
   4. Provide strike as recommended by manufacturer for application indicated.
   5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.
   6. For electrical options, provide quick connect plug-in pre-wired connectors.

2.05 ELECTRIC STRIKES

A. Manufacturers:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Electric Strikes: Comply with BHMA A156.31, Grade 1.
   1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.
   2. Provide non-handed 24 VDC electric strike suitable for door frame material and scheduled lock configuration.
   3. Connect electric strikes into fire alarm where non-rated doors are scheduled to release with fire or sprinkler alarm condition.

2.06 LOCK CYLINDERS

A. Manufacturers:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. No Substitutions

B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
   1. Provide cylinders from same manufacturer as locking device.
   2. Provide cams and/or tailpieces as required for locking devices.
   3. 2-3/4" BACKSET ASA STRIKE US15

2.07 CYLINDRICAL LOCKS

A. Manufacturers:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. No Substitutions

B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
   1. Bored Hole: 2-1/8 inch diameter.
   2. Latchbolt Throw: 1/2 inch, minimum.
   3. Backset: 2-3/4 inch unless otherwise indicated.
   4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
      a. Finish: To match lock or latch.
      b. Flat-Lip Strikes: Provide for locks with three piece antifriction latchbolts as recommended by manufacturer.
      c. Extra-Long-Lip Strikes: Provide for locks used on frames with applied wood casing trim.
      d. Rabbet Front and Strike: Provide on locksets for use with rabbeted meeting rails.
   5. Provide a lock for each door, unless otherwise indicated that lock is not required.
   6. Provide an office lockset for swinging door where hardware set is not indicated.
   7. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.

2.08 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
   1. Forms+Surfaces; _____: www.forms-surfaces.com/#sle.
   2. Hager Companies; _____: www.hagerco.com/#sle.
   3. Pamex, Inc; _____: www.pamexinc.com/#sle.
   4. Trimco; _____: www.trimcohardware.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Door Pulls and Push Plates: Comply with BHMA A156.6.
   1. Pull Type: Straight, unless otherwise indicated.
   2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
      a. Edges: Beveled, unless otherwise indicated.
   3. Material: Aluminum, unless otherwise indicated.
   4. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.
   5. On solid doors, provide matching door pull and push plate on opposite faces.
   6. On glazed storefront doors, provide matching door pulls/push plates on both faces unless otherwise indicated.

2.09 DOOR PULLS AND PUSH BARS

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   2. Hager Companies; _____: www.hagerco.com/#sle.
   3. Trimco; _____: www.trimcohardware.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Door Pulls and Push Bars: Comply with BHMA A156.6.
   1. Bar Type: Bar set, unless otherwise indicated.
   2. Material: Aluminum, unless otherwise indicated.

2.10 COORDINATORS

A. Manufacturers:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Coordinators: Provide on doors having closers and self-latching or automatic flush bolts to ensure that inactive door leaf closes before active door leaf.
   1. Type: Bar, unless otherwise indicated.
   2. Material: Aluminum, unless otherwise indicated.

3. Ensure that coordination of other door hardware affected by placement of coordinators and carry bar is applied properly for completely operable installation.

2.11 CLOSERS

A. Manufacturers; Surface Mounted:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Manufacturers; Concealed - Overhead:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. Substitutions: See Section 01 60 00 - Product Requirements.

C. Closers: Comply with BHMA A156.4, Grade 1.
   1. Type: Surface mounted to door.
   2. Provide door closer on each exterior door.
   3. Provide door closer on each fire-rated and smoke-rated door.
      a. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
   4. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
   5. At corridor entry doors, mount closer on room side of door.
   6. At outswinging exterior doors, mount closer on interior side of door.

2.12 OVERHEAD STOPS AND HOLDERS

A. Manufacturers:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.
   1. Provide stop for every swinging door, unless otherwise indicated.
   2. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop, unless otherwise indicated.

2.13 PROTECTION PLATES

A. Manufacturers:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Drip Guard: Provide at head of exterior doors unless covered by roof or canopy.

2.14 KICK PLATES

A. Manufacturers:
   1. Hiawatha, Inc, an Activar Construction Products Group company; _____: www.activarcpg.com/hiawatha/#sle.
   2. Trimco; _____: www.trimcohardware.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
   1. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

2.15 DOOR HOLDERS

A. Manufacturers:
   1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Door Holders: Comply with BHMA A156.16, Grade 1.
   1. Provide surface mounted door holders when wall or floor stop is not applicable and hold-open device is mounted on door.

2. Type: Angle stop at head of opening.
3. Material: Aluminum.

2.16 FLOOR STOPS

A. Manufacturers:
1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
2. Coordinate with Archtect and KCDC on locations of floor stops or wall stop needs..
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
1. Provide floor stops when wall surface is not available; be cautious not to create a tripping hazard.
2. Type: Manual hold-open, with bumper floor stop.
3. Material: Aluminum housing with rubber insert.

2.17 WALL STOPS

A. Manufacturers:
1. Basis of Design: See Section 2.01 - DESIGN AND PERFORMANCE CRITERIA .
2. Coordinate with Archtect and KCDC on locations of floor stops or wall stop needs..
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
1. Provide wall stops to prevent damage to wall surface upon opening door.
2. Type: Bumper, concave, wall stop.
3. Material: Aluminum housing with rubber insert.

2.18 ASTRAGALS

A. Manufacturers:
1. Hager Companies; _____: www.hagerco.com/#sle.
2. National Guard Products, Inc; _____: www.ngpinc.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Astragals: Comply with BHMA A156.22.
1. Provide surface mounted astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
2. Type: Split, two parts, and with sealing gasket.
3. Material: Aluminum, with neoprene weatherstripping.
4. Provide non-corroding fasteners at exterior locations.

2.19 THRESHOLDS

A. Manufacturers:
1. Pemko; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Hager Companies; _____: www.hagerco.com/#sle.
3. National Guard Products, Inc; _____: www.ngpinc.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thresholds: Comply with BHMA A156.21.
1. Provide threshold at each exterior door, unless otherwise indicated.
2. Type: Flat surface.
3. Material: Aluminum.
4. Threshold Surface: Smooth and flat.
5. Field cut threshold to profile of frame and width of door sill for tight fit.
6. Provide non-corroding fasteners at exterior locations.
7. Set in full bed per drawings

2.20 WEATHERSTRIPPING AND GASKETING

A. Weatherstripping and Gasketing: Comply with BHMA A156.22.
   1. Head and Jamb Type: Adjustable.
   2. Door Sweep Type: Encased in retainer.
   3. Material: Aluminum, with brush weatherstripping.
   4. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated; .
   5. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.21 SIGNAGE

A. See Section 10 14 00 for additional signage requirements.

B. Signage (Room Name Plates and Numbers): Provide on doors for individuals to easily identify room names and/or numbers.
   1. Text Required: "RESTROOM" with symbols and braille text.
   2. Material: In plastic or metal with paint used to create necessary text, adhered to door.

2.22 SILENCERS

A. Manufacturers:
   1. Ives, an Allegion brand; _____: www.allegion.com/us/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
   1. Single Door: Provide three on strike jamb of frame.
   2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
   3. Material: Rubber, gray color.

2.23 VIEWER

A. Viewer: Provide at inside of door at eye level to see who is on outside of door.
   1. Material: Brass.

2.24 KEY CONTROL SYSTEMS

A. Manufacturers:
   1. Basis of Design: I-Core by Landlord Locks.

B. Key Control Systems: Comply with guidelines of BHMA A156.28.
   1. Provide keying information in compliance with DHI (KSN) standards.
   2. Keying: Grand master keyed.
   3. Supply keys in following quantities:
      a. 1 each Grand Master keys and per KCDC's requirements.

2.25 KEY CABINET

A. Manufacturers:
   1. Knox Company; _____: www.knoxbox.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Key Cabinet: Sheet steel construction, piano hinged door with key lock; BHMA A156.28.
   1. Mounting: Wall-mounted.
   2. Capacity: Actual quantity of keys, plus 25 percent additional capacity.
   3. Size key hooks to hold 6 keys each.
   4. Finish: Baked enamel, manufacturer's standard color.
   5. Key cabinet lock to building keying system.

2.26 FIRE DEPARTMENT LOCK BOX

A. Manufacturers:
   1. Knox Company; Knox-Box Rapid Entry System, _____: www.knoxbox.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Department Lock Box:
   1. Heavy-duty, surface mounted, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.
   2. Capacity: Holds 10 keys.
   3. Finish: Manufacturer's standard black.

2.27 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
   1. Primary Finish: To be Selected by Architect; BHMA A156.18.
   2. Exceptions:
      a. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.
      b. Hinges for Fire-Rated Doors: Steel base material with painted finish, in compliance with NFPA 80.
      c. Door Closer Covers and Arms: Color as selected by Architect from manufacturer's standard colors unless otherwise indicated.
      d. Aluminum Surface Trim and Gasket Housings: Anodized to match door panel finish, not other hardware, unless otherwise indicated.
      e. Hardware for Aluminum Storefront Doors: Finished to match door panel finish, except at hand contact surfaces provide stainless steel with satin finish, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Use templates provided by hardware item manufacturer.

D. Do not install surface mounted items until application of finishes to substrate are fully completed.

E. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list, unless noted otherwise on drawings.
   1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   2. For Aluminum-Framed Storefront Doors and Frames: Refer to Section 08 43 13.
   3. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
   4. Stile and Rail Wood Doors: Refer to Section 08 14 33.
   5. Mounting heights in compliance with ADA Standards:
      a. Locksets: 40-5/16 inch.
      b. Push Plates/Pull Bars: 42 inch.
      c. Deadlocks (Deadbolts): 48 inch.
      d. Door Viewer: 43 inch; standard height 60 inch.

F. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.
   1. Refer to Section 07 92 00 for additional requirements.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01 40 00 - Quality Requirements.

B. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.04 ADJUSTING

A. Adjust work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

D. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: _____ components with requirement for plastic.

B. Section 06 41 00 - Architectural Wood Casework: Cabinets with requirements for glass shelves and _____.

C. Section 07 25 00 - Weather Barriers.

D. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

E. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

F. Section 08 14 33 - Stile and Rail Wood Doors: Glazed lites in doors.

G. Section 08 32 00 - Sliding Glass Doors: Glazing furnished by door manufacturer.

H. Section 08 41 26 - All-Glass Entrances and Storefronts: Glazing furnished as part of entrance assembly.

I. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

J. Section 08 54 13 - Fiberglass Windows: Glazing furnished by window manufacturer.

K. Section 10 28 00 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1036 - Standard Specification for Flat Glass; 2016.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

G. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

J. GANA (GM) - GANA Glazing Manual; 2008.

K. GANA (SM) - GANA Sealant Manual; 2008.

L. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Certificate: Certify that products of this section meet or exceed specified requirements.

C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in KCDC's name and registered with manufacturer.

D. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 FIELD CONDITIONS

A. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
   2. Viracon, Inc: www.viracon.com/#sle.
   3. Substitutions: Refer to Section 01 60 00 - Product Requirements.

B. Laminated Glass Manufacturers:
   1. Viracon, Architectural Glass segment of Apogee Enterprises, Inc; _____: www.viracon.com/#sle.
   2. Substitutions: Refer to Section 01 60 00 - Product Requirements.

C. Wired Glass Manufacturers:
   1. GGI - General Glass International; Wire Glass: www.generalglass.com/#sle.
   2. Substitutions: Refer to Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of ASCE 7.
   3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.

4. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.

2.03 INSULATING GLASS UNITS

A. Manufacturers:
   1. Fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
   2. Substitutions: Refer to Section 01 60 00 - Product Requirements.

B. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Spacer Color: Black.
   4. Edge Seal:
      a. Color: Black.
   5. Purge interpane space with dry air, hermetically sealed.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.05 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove non-permanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 91 00
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Sealing frames to weather barrier installed on adjacent construction.

B. Section 07 62 00 - Sheet Metal Flashing and Trim.

C. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

D. Section 09 91 13 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

D. Test Reports: Independent agency reports showing compliance with specified performance criteria.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
   1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. Airline Louvers; _____: www.airlinelouvers.com/#sle.
   2. Airolite Company, LLC; _____: www.airolite.com/#sle.
   3. American Warming and Ventilating; _____: www.awv.com/#sle.
   4. Construction Specialties, Inc; Acoustical Louver: www.c-sgroup.com/#sle.
   5. Industrial Louvers, Inc; _____: www.industriallouvers.com/#sle.
   6. Pottorff; _____: www.pottorff.com/#sle.
   7. Ruskin; _____: www.ruskin.com/#sle.

8. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
   2. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), ____ alloy, ____ temper.

2.04 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.

B. Color: As indicated on drawings.

2.05 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

B. Insect Screen: as indicated on drawings size aluminum mesh.

C. Fasteners and Anchors: Galvanized steel.

D. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Set sill members and sill flashing in continuous bead of sealant.

D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Secure louver frames in openings with concealed fasteners.

F. Coordinate with installation of mechanical ductwork.

3.03 ADJUSTING

A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.04 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile
   2. Carpet tile
   3. Thin-set Ceramic tile
   4. Resilient Flooring
   5. Resilient Athletic Flooring

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Patching compound.

E. Remedial floor coatings.

F. Preparation of new wood-based floors and subfloors for installation of new floor coverings.

1.02 RELATED REQUIREMENTS

A. Section 01 40 00 - Quality Requirements: Additional requirements relating to testing agencies and testing.

B. Section 03 30 00 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

C. Section 03 30 00 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2019.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.

1.04 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Copies of specified test methods.
   4. Recommendations for remediation of unsatisfactory surfaces.
   5. Submit report directly to KCDC.
   6. Submit report not more than two business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

1.05 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing will be performed by an independent testing agency employed and paid by KCDC.

B. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

C. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.

D. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

E. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.
   4. Achieve and maintain specified ambient conditions.
   5. Notify KCDC when specified ambient conditions have been achieved and when testing will start.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
   3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
   1. Thickness: 1/8 inch, maximum.

2. Thickness: As required for application and in accordance with manufacturer's installation instructions.
3. Products:
   a. Allied Construction Technologies, Inc; AC Tech 2170: www.actechperforms.com.
   b. ARDEX Engineered Cements; ARDEX MC RAPID: www.ardexamericas.com
   c. Floor Seal Technology, Inc; MES 100 with Floor Seal FloorCem SLU: www.floorseal.com
   d. Koster American Corporation; Koster VAP I 2000 with Koster SL Premium overlay: www.kosterusa.com
   e. LATICRETE International, Inc; LATICRETE NXT Vapor Reduction Coating with LATICRETE NXT Level Plus: www.laticrete.com.
   f. LATICRETE International, Inc; LATICRETE SUPERCAP Moisture Vapor Control with LATICRETE SUPERCAP Underlayment: www.laticrete.com
   g. Maxxon Corporation; Aquafin SG2: www.maxxon.com
   h. Proflex Products, Inc; Moisture Barrier 25 with DPU - Deep Pour Underlayment: www.proflex.us
   i. Sika Corporation; Sikafloor Moisture Tolerance Epoxy Primer and Sikafloor Self-Leveling Moisture Tolerant Resurfacer: www.sikafloorusa.com
   j. Stauf USA, LLC; ERP-270 Perma-Seal: www.staufusa.com
   k. TEC, an H.B. Fuller Construction Products Brand; TEC LiquiDam with TEC Level Set 200 SLU: www.tecspecialty.com
   l. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Follow recommendations of testing agency.

B. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   3. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. Specified remediation, if required.
   5. Patching, smoothing, and leveling, as required.
   6. Other preparation specified.
   7. Adhesive bond and compatibility test.
   8. Protection.

3.02 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.03 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.04 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.05 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.06 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.07 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Wood stud wall framing

D. Metal channel ceiling framing.

E. Resilient sound isolation clips.

F. Acoustic insulation.

G. Gypsum sheathing.

H. Cementitious backing board.

I. Gypsum wallboard.

J. Joint treatment and accessories.

K. Water-resistive barrier over exterior wall sheathing.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 40 00 - Cold-Formed Metal Framing: Structural steel stud framing.

C. Section 06 10 00 - Rough Carpentry: Building framing and sheathing.

D. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

E. Section 07 21 00 - Thermal Insulation: Acoustic insulation.

F. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

G. Section 07 84 00 - Firestopping: Top-of-wall assemblies at fire rated walls.

H. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

I. Section 09 22 16 - Non-Structural Metal Framing.

J. Section 09 30 00 - Tiling: Tile backing board.

K. Section 31 31 16 - Termite Control: Field-applied termiticide and mildewcide for metal framing.

1.03 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

D. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).

E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2018.

G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2019a.

H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2018.

I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2018.

J. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a (Reapproved 2019).

K. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2013.

L. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

M. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2018a.

N. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019.

O. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

Q. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

R. ASTM E413 - Classification for Rating Sound Insulation; 2016.

S. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

T. GA-600 - Fire Resistance Design Manual; 2015.

U. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016.

V. UL (FRD) - Fire Resistance Directory; Current Edition.

W. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on metal framing, gypsum board, accessories, joint finishing system, and wood framing.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Sound-Rated: Provide completed assemblies with the following characteristics per drawings
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. Fire Rated Partitions: UL listed assembly No. as indicated on drawings.
   2. Fire Rated Ceilings and Soffits: as indicated on drawings hour fire rating.
   3. Fire Rated Shaft Walls: UL listed assembly No. as indicated on drawings.
   4. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
   5. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich; ____: www.clarkdietrich.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
   1. Studs: "C" shaped with knurled or emobossed faces.
   2. Runners: U shaped, sized to match studs.

C. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
   1. Products:
      a. Same manufacturer as other framing materials.

D. Area Separation Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with specified performance requirements.

E. Non-structural Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
   2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company; ____: www.americangypsum.com/#sle.
   2. CertainTeed Corporation; ____: www.certainteed.com/#sle.
   3. Continental Building Products; ____: www.continental-bp.com/#sle.
   4. Georgia-Pacific Gypsum; ____: www.gpgypsum.com/#sle.
   5. National Gypsum Company; ____: www.nationalgypsum.com/#sle.
   6. PABCO Gypsum; ____: www.pabcogypsum.com/#sle.
   7. USG Corporation; ____: www.usg.com/#sle.
   8. _____.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
   3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold resistant board is required at all locations.
   4. Thickness:
      a. Vertical Surfaces: as indicated on drawings inch.
      b. Ceilings: as indicated on drawings inch.
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
   5. Paper-Faced Products:
      a. American Gypsum Company; LightRoc Gypsum Wallboard.
      b. American Gypsum Company; FireBloc Type X Gypsum Wallboard.
      c. Georgia-Pacific Gypsum; ToughRock.
      d. Georgia-Pacific Gypsum; ToughRock Fireguard X.
      e. Substitutions: See Section 01 60 00 - Product Requirements.
   6. Mold Resistant Paper Faced Products:
      a. American Gypsum Company; M-Bloc.
      b. American Gypsum Company; M-Bloc Type X.
      c. CertainTeed Corporation; M2Tech 5/8" Type C Moisture & Mold Resistant Drywall.

d. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall.
e. Georgia-Pacific Gypsum; ToughRock Mold-Guard.
f. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard.
g. Substitutions: See Section 01 60 00 - Product Requirements.

7. Glass Mat Faced Products:
   a. Georgia-Pacific Gypsum; DensArmor Plus.
   b. Georgia-Pacific Gypsum; DensArmor Plus Fireguard C.
   c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Abuse Resistant Wallboard:
1. Application: high traffic areas as indicated on drawings.
2. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
4. Paper-Faced Type: Gypsum wallboard as defined in ASTM C1396/C1396M.
5. Type: Fire resistance rated Type X, UL or WH listed.
6. Thickness: 5/8 inch.
7. Edges: Tapered.
8. Paper-Faced Products:
   a. American Gypsum Company; M-Bloc AR Type X.
   b. CertainTeed Corporation; Extreme Abuse Resistant Drywall with M2Tech.
   c. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold Guard Abuse-Resistant.
   d. National Gypsum Company; Gold Bond Hi-Abuse XP Gypsum Board.
   e. Substitutions: See Section 01 60 00 - Product Requirements.

D. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including tub and shower surrounds, shower ceilings, and other wet locations as indicated on drawings.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
   a. Regular Type: Thickness as indicated on drawings inch.
   b. Fire Resistant Type: Type X core, thickness as indicated on drawings inch.
   c. Products:
      1) Georgia-Pacific Gypsum; DensShield Tile Backer.
      2) National Gypsum Company; Gold Bond eXP Tile Backer.
      3) Substitutions: See Section 01 60 00 - Product Requirements.

E. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
1. Application: Vertical surfaces behind thinset tile, except in wet areas.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Type: Regular and Type X, in locations indicated.
4. Type X Thickness: 5/8 inch.
5. Regular Board Thickness: 1/2 inch.
6. Edges: Tapered.
7. Products:
   a. American Gypsum Company; M-Bloc.
   b. American Gypsum Company; M-Bloc Type X.
   c. Georgia-Pacific Gypsum; ToughRock Mold-Guard Gypsum Board.
   d. Georgia-Pacific Gypsum; DensArmor Plus.
   e. National Gypsum Company; Gold Bond XP Gypsum Board.
   f. Substitutions: See Section 01 60 00 - Product Requirements.

F. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.

2. Thickness: as indicated on drawings inch.
3. Edges: Tapered.
4. Products:
    a. CertainTeed Corporation; Interior Ceiling Drywall.
    b. Continental Building Products; Sagcheck.
    c. Georgia-Pacific Gypsum; ToughRock Span 24 Ceiling Board.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

G. Exterior Sheathing Board: As specified in Section 06 10 00.

H. Exterior Sheathing Board: As specified in Section 05 40 00.

I. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
2. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X.
3. Types: Regular and Type X, in locations indicated.
4. Type X Thickness: 5/8 inch.
5. Regular Type Thickness: 1/2 inch.
6. Edges: Tapered.
7. Products:
    a. American Gypsum Company; Exterior Soffit Gypsum Wallboard Type X.
    b. Continental Building Products; Soffitboard.
    c. Continental Building Products; Soffitboard Type X.
    d. Georgia-Pacific Gypsum; ToughRock Fireguard C Soffit Board.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

J. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
1. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
2. Glass Mat Faced Products:
    a. American Gypsum Company; M-Glass Shaft Liner.
    b. CertainTeed Corporation; GlasRoc Shaftliner Type X.
    c. Continental Building Products; Shaftliner Type X.
    d. Georgia-Pacific Gypsum; DensGlass Shaftliner (mold-resistant).
    e. National Gypsum Company; Gold Bond Brand eXP Shaftliner.
    f. National Gypsum Company; Gold Bond Fire-Shield Shaftliner XP.
    g. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: As specified in Section 07 21 00.

B. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
2. Tape Thickness: 1/4 inch.
3. Products:
    a. Armacell LLC; ArmaSound MTD: www.armacell.us/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
1. Products:
    a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.

b. Liquid Nails, a brand of PPG Architectural Coatings; AS-825 Acoustical Sound Sealant: www.liquidnails.com/#sle.
c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.

D. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
a. Products:
1) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com/#sle.
2) ClarkDietrich; Strait-Flex Big-Stick: www.clarkdietrich.com/#sle.
3) Trim-Tex, Inc; _____: www.trim-tex.com/#sle.
4) Substitutions: See Section 01 60 00 - Product Requirements.

E. Ceiling Pockets with Prewired Raceway: UL 325 listed, extruded aluminum shade pocket with removable closure panel and ceiling tile support, for recess mounting in acoustical tile or drywall ceilings; size and configuration as indicated on drawings.
1. Designed to accommodate installation of motor control and wiring accessories within pocket.
2. Products:
a. MechoShade Systems LLC; ElectroPocket; www.mechoshade.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

F. Moisture Guard Trim: ASTM C1047, rigid plastic, 48 inch length, applied to bottom edge of gypsum board.
1. Products:
a. Waterguard USA; Waterguard: www.waterguard-usa.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

G. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

H. Finishing Compound: Surface coat and primer, takes the place of skim coating.
1. Products:
a. CertainTeed Corporation; Quick Prep Plus Interior Prep Coat: www.certainteed.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

I. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
1. Products:
a. CertainTeed Corporation; Level V Wall and Ceiling Primer/Surfacer with M2Tech: www.certainteed.com/#sle.

J. Abuse Resistant Finishes:
1. Acrylic, water-based, non-textured, high build, tintable primer and surfacer.

K. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

L. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

M. Adhesive for Attachment to Wood, ASTM C557 and Metal:

N. Exterior Soffit Vents: One piece, perforated, ASTM B221 6063 T5 alloy aluminum, with edge suitable for direct application to gypsum board and manufactured especially for soffit application. Provide continuous vent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
   1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches on center.
   2. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimension and install sequentially between special friction studs.
   1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
   2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

C. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

F. Resilient Sound Isolation Clips: Install resilient sound isolation clips, and where applicable, associated furring sections and channels, in accordance with clip manufacturer's written instructions.

G. Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.

H. Blocking: Install wood blocking for support of:
   1. Framed openings.
   2. Wall mounted cabinets.
   3. Plumbing fixtures.
   4. Toilet partitions.
   5. Toilet accessories.
   6. Wall mounted door hardware.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

C. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.

D. Cementitious Backing Board: Install over steel framing members, wood framing members, and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

E. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

F. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For non-rated assemblies, install as follows:
   1. Single-Layer Applications: Adhesive application.
   2. Double-Layer Application: Install base layer using screws or nails. Install face layer using adhesive.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

E. Moisture Guard Trim: Install on bottom edge of gypsum board according to manufacturer's instructions and in locations indicated on drawings.

F. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings. Provide vent area specified.

3.07 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 3: Walls to receive textured wall finish.
   4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   5. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
   6. Level 0: Temporary partitions.
   7. Level 0: Surfaces indicated to be finished in later stage of project.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 21 00 - Steel Joists: Execution requirements for anchors for attaching work of this section.

B. Section 05 40 00 - Cold-Formed Metal Framing: Structural load bearing metal stud framing and Exterior wall stud framing.

C. Section 05 40 00 - Cold-Formed Metal Framing: Execution requirements for anchors for attaching work of this section.

D. Section 05 50 00 - Metal Fabrications: Metal fabrications attached to stud framing.

E. Section 05 50 00 - Metal Fabrications: Execution requirements for anchors for attaching work of this section.

F. Section 05 51 00 - Metal Stairs: Execution requirements for anchors for attaching work of this section.

G. Section 06 10 00 - Rough Carpentry: Wood blocking within stud framing.

H. Section 06 10 00 - Rough Carpentry: Wall sheathing.

I. Section 07 21 00 - Thermal Insulation: Insulation.

J. Section 07 25 00 - Weather Barriers.

K. Section 07 62 00 - Sheet Metal Flashing and Trim: Head and sill flashings

L. Section 07 84 00 - Firestopping: Sealing top-of-wall assemblies at fire rated walls.

M. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

N. Section 08 31 00 - Access Doors and Panels.

O. Section 09 21 16 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

P. Section 31 31 16 - Termite Control: Field-applied termiticide and mildewcide for metal framing.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.

C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. CEMCO; ____: www.cemcosteel.com/#sle.
   2. ClarkDietrich; _____: www.clarkdietrich.com/#sle.
   3. Marino; ____: www.marinoware.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING MATERIALS

A. Fire Rated Assemblies: Comply with applicable code and as indicated on drawings.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: C shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.

2.03 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

3.02 CEILING AND SOFFIT FRAMING

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

B. Install furring independent of walls, columns, and above-ceiling work.

C. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

D. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.

E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

F. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

END OF SECTION

SECTION 09 22 26

METAL SUSPENSION SYSTEMS

DRYWALL FLAT APPLICATIONS

PART 1 - GENERAL

2.01 1.1 RELATED DOCUMENTS

2.02 DRAWINGS AND GENERAL CONDITIONS OF CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISIONS-1 SPECIFICATION SECTIONS APPLY TO WORK OF THIS SECTION.

2.03 1.2 SUMMARY

A. Section Includes:
   1. Metal suspension for the support of gypsum drywall in ceiling and soffit installation for exterior and interior finishes.

B. Related Sections:
   1. 09 20 00 Plaster and Gypsum Board Assemblies
   2. 09 51 00 Ceilings
   3. Division 23 Heating, Ventilating and Air Conditioning
   4. Division 26 Electrical

2.04 1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   2. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
   3. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
   4. ASTM D 610 Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
   5. ASTM B 117 Standard Practice for Operating Salt Spray (Fog) Apparatus
   6. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   7. ASTM C 645 Standard Specification for Nonstructural Steel Framing Members
   8. ASTM C 754 Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board
   9. ASTM C1002 Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
   10. ASTM E 119 Standard Test Method for Fire Tests of Building Construction and Material (if applicable).
   11. NOA #07-0119.02 Miami/Dade Wind Uplift.
   12. NAO #09-0512.02 Miami/Dade Impact.
   13. ESR-1289 ICC-ES Evaluation Report.

2.05 1.4 SUBMITTALS

A. Samples: Submit samples and data page of Drywall Suspension systems components, including main runner, cross tees and angle molding.

B. Manufacturer's Data: Submit technical data and drawings illustrating the details of the system and the manufacturer’s recommended installation instructions.

2.06 1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: To ensure proper interface, all components shall be produced or supplied by a single manufacturer.

B. All accessory components from other manufacturers shall conform to ASTM standards.

C. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which drywall ceilings function as a fire protective membrane and tested per ASTM E 119. Installation in accordance with the UL Design being referenced.

D. Coordination of Work:
   1. Coordinate work with installers of related trades including, but not limited to acoustical ceilings, building insulation, gypsum board, heating ventilating and air conditioning, electrical s, and sprinklers.
   2. All work above the ceiling line should be completed prior to installing the drywall sheet goods.
   3. There should be no materials resting against or wrapped around the suspension system, hanger wires or ties.

2.07 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

2.08 1.7 WARRANTY

A. Suspensions System: Submit a written limited warranty executed by the manufacturer, agreeing to repair or replace grid components that are supplied with a hot-dipped galvanized coating or aluminum base material. Failures include, but are not limited to:

B. The occurrence of 50% red rust as defined by ASTM D 610 test procedures as a result of defects in materials or factory workmanship.

C. Warranty Period:

D. Grid: Ten years from date of installation.

E. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

3.01 2.1 MANUFACTURERS

3.02 ARMSTRONG WORLD INDUSTRIES, INC.

3.03 2.2 DRYWALL SUSPENSION SYSTEMS

A. Components:
   1. Main Beam: Shall be double-web construction (minimum 0.0179 inch prior to protective coating, ASTM C645), hot dipped galvanized (per ASTM A653).
      a. HD8906: 1-11/16 inch web height, 1-1/2 inch flange, available with G40 or G90 hot dipped galvanization.
   2. Primary Cross Tees: Shall be double-web steel construction (minimum 0.0179 inch prior to protective coating, ASTM C645), hot dipped galvanized (minimum G40 or G90 per ASTM A653)
      a. XL8945P: 48 inch web height 1-1/2 inch with rectangular bulb and pre-finished 1-1/2 inch knurled flange
      b. XL8945PHRC: 48 inch web height 1-1/2 inch with rectangular bulb and pre-finished 1-1/2 inch knurled flange. (61% Recycle content, 53% Post Consumer, 8& Pre-Consumer).
      c. XL8965: 72 inch web height 1-1/2 inch with rectangular bulb and pre-finished 1-1/2 inch knurled flange.
   3. QuikStix Soffits DGS: Shall be double web steel construction (minimum 0.0179 inch prior to protective coating, ASTM C645), Tees designed for creating soffits; 1-1/2 inch web height. 1-1/2 inch flange, flattened bulb, bending crimp, knockouts and alignment holes to

facilitate creating 15, 30, 45, 60 and 90 degree angles; available with G40 or G90 hot dipped galvanization.

a. QS612: 12 foot tee with knockouts 6 inches on center, route holes 6 inches on center.
b. QS812: 12 foot tee with knockouts 8 inches on center route holes 8 inches on center.,

4. Wall Molding:
   a. LAM-12: 12 foot Locking Angle Molding, 1-1/4 inch x 1-1/4 inch with pre-engineered locking tabs punched 8 inches on center, knurled surface, screw stop hem, pre-punched holes in top flange, 4" O.C., .018 mil. 25g.
   b. LAM-12HRC: 12 foot Locking Angle Molding, 1-1/4 inch x 1-1/4 inch with pre-engineered locking tabs punched 8 inches on center, knurled surface, screw stop hem, pre-punched holes in top flange, 4" O.C., .018 mil. 25g. (61% Recycle content, 53% Post Consumer, 8& Pre-Consumer).
   c. KAM -12: 12 foot Knurled Angle molding, 1-1/4 inch x 1-1/4 inch, knurled surface, screw stop hem, pre-punched holes in top flange, 4" O.C., .018 mil. 25g.
5. Transition Molding: Drywall to Acoustical ceiling.
   a. Pre-Painted Armstrong Global White integral acoustical flange and drywall taping flange, hot dipped cold rolled steel.
   b. 7908: 120 inch with 15/16 inch acoustical flange.(120 lf per ctn).
6. Clips:
   a. DW90C: 90 degree, Drywall Angle Clip
   b. DLCC: Direct Load Ceiling Clip.
   c. QSUTCA: Uptight Clip.
7. Screws for wallboard application shall be bugle head screws in accordance with thickness of material used.

B. Structural Classification:
   1. Main Beam shall be heavy duty per ASTM C 635.
   2. Classification can require wires to be closer together for additional loading when used to support double layer gypsum, verticals, slopes, domes, half barrels, circles, soffits, canopies, and step conditions which call for loading or unusual designs and shapes in drywall construction. Using cross tees in the construction of circles, barrels, etc. is common in order to hold the radius.
   3. Deflection of fastening suspension system supporting light fixtures, ceiling grilles, access doors, verticals and horizontal loads shall have a maximum deflection of 1/360 of the span.

PART 3 - EXECUTION

4.01 3.1 INSTALLATION - GENERAL

A. Install suspension system in accordance with the manufacturer's technical guides, Hanging and Framing Flat Ceilings CS3539, Hanging and Framing Curved Ceilings CS3540 and 6' DGS tees CS3776 ,and in compliance with ASTM installation standard, and with applicable codes as required by the authorities having jurisdiction.

B. To secure to metal clips, concrete inserts, steel bar joist or steel deck, use power actuated fastener, or insert. Coordinate placement for hanger wire spaced as required for expected ceiling loads and layout.

C. Install hanger wire as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Provide additional wires at light fixtures, grilles, and access doors where necessary. A pigtail knot shall be used with three tight wraps at top and bottom fastening locations.

D. Add additional wire as needed when using compatible clips and accessories.

E. Control Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction as shown on drawings.

F. Expansion Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction as shown on drawings.

G. Main beams shall be suspended from the overhead construction with hanger wire, spaced as required for expected ceiling loads, along the length of the main beams.

H. Install cross tees at on center spacing as specified by the drywall manufacturer. Typical drywall cross tee spacing:
   1. 16 inches on center with 5/8 or 1/2 inch gypsum board
   2. 24 inches on center with 5/8 inch gypsum board

I. Other items such as wood, sheet metal, or plastic panels should be screwed to comply with deflection limit equivalent to that of the ceiling installation.

J. Use channel molding or angle molding to interface with Drywall Grid System to provide perimeter attachment or to obtain drop soffits, verticals, slopes, etc.

K. To suspend a second ceiling beneath a new or existing drywall ceiling, without breaching the integrity of the upper ceiling, use the Drywall Clip. To form a transition from a drywall ceiling to an acoustical ceiling, use the Drywall Transition Clips spaced as required for expected loads.

L. For light fixtures (Type G, Type F) use secondary framing cross tees as required to frame opening.

M. Single cross tees in a route hole to be secured by 7/16 inch framing screw or alternative methods.

4.02 3.3 INSTALLATION - INTERIOR APPLICATIONS

A. Install main beams and cross tees at the on center spacing required for ceiling loading, and location of in-ceiling services.

B. Additional bracing as required by code.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Ceramic accessories.

E. Ceramic trim.

F. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 03 54 00 - Cast Underlayment.

B. Section 07 13 00 - Sheet Waterproofing.

C. Section 07 14 00 - Fluid-Applied Waterproofing.

D. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

E. Section 07 95 13 - Expansion Joint Cover Assemblies: Expansion joint components.

F. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

G. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2017.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.

C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2010).

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).

F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).

K. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).

L. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).

N. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2017.

O. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2013 (Revised).

P. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2010 (Reaffirmed 2016).

Q. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).

R. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014.

S. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.

T. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018.

U. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Installer's Qualification Statement:
   1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

F. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Tile: 5 percent of each size, color, and surface finish combination, but not less than one box of each type.

1.05 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.

1.06 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
   1. Minimum size of mock-up is indicated on drawings.
   2. Approved mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.
   1. Atlas Concord USA.

B. Porcelain Tile, Type FT-1, FT-2 & WT-1: ANSI A137.1, standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Color(s): As indicated on drawings.
   3. Size: 12x24
   4. Trim Units: Matching bullnose, cove base, and cove shapes in sizes coordinated with field tile.
   4. Products: as indicated in Finish Legend

2.02 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
   1. Applications:
      a. Open Edges: Bullnose.
      b. Inside Corners: Jointed.
      c. Floor tile to Wall tile Joints: Cove shape
      d. Floor to wall joints: cove base
   2. Manufacturers: Same as for tile.

B. Non-Ceramic Trim: Satin brass anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:
      a. Open edges of floor tile.
      b. Transition between floor finishes of different heights.
      c. Thresholds at door openings.
      d. Expansion and control joints, floor and wall.
      e. Borders and other trim as indicated on drawings.
   2. Manufacturers:
      a. Schluter-Systems: www.schluter.com

2.03 SETTING MATERIALS

A. Manufacturers:
   1. LATICRETE International, Inc; www.laticrete.com
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GROUTS

A. Manufacturers:
   1. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Standard Grout: ANSI A118.6 standard cement grout.
   1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
   2. Use sanded grout for joints 1/8 inch wide and larger; use un-sanded grout for joints less than 1/8 inch wide.

3. Color(s): As selected by Architect from manufacturer's full line.
4. Products:
   a. LATICRETE International, Inc; LATICRETE 1500 Sanded Grout: www.laticrete.com
   b. Merkrete, by Parex USA, Inc; Merkrete Duracolor Non-Sanded Grout: www.merkrete.com
   c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Applications: Where indicated.
2. Color(s): As selected by Architect from manufacturer's full line.
3. Products:
   a. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com
   b. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com

2.05 MAINTENANCE MATERIALS

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
1. Applications: Between tile and plumbing fixtures.
2. Color(s): As selected by Architect from manufacturer's full line.
3. Products:
   a. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com

B. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
1. Composition: Water-based colorless silicone.
2. Color(s): As indicated.

2.06 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
1. Crack Resistance: No failure at 1/8 inch gap, minimum.
2. Fluid or Trowel Applied Type:
   a. Thickness: 20 mils, maximum.
   b. Products:
      1) LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane: www.laticrete.com

B. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.
1. Products:
   a. Custom Building Products; WonderBoard Lite Backerboard: www.custombuildingproducts.com
   b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).

1. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.

3.05 INSTALLATION - WALL TILE

A. On exterior walls install in accordance with TCNA (HB) Method W244, thin-set over cementitious backer units, with waterproofing membrane.

B. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

C. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Placement of special anchors or inserts for suspension system.

B. Section 03 30 00 - Cast-in-Place Concrete: Placement of special anchors or inserts for suspension system.

C. Section 05 31 00 - Steel Decking: Placement of special anchors or inserts for suspension system.

D. Section 07 21 00 - Thermal Insulation: Acoustical insulation.

E. Section 08 31 00 - Access Doors and Panels: Access panels.

F. Section 09 51 53 - Direct-Applied Acoustical Ceilings.

G. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.

H. Section 23 37 00 - Air Outlets and Inlets: Air diffusion devices in ceiling.

I. Section 26 51 00 - Interior Lighting: Light fixtures in ceiling system.

J. Section 28 46 00 - Fire Detection and Alarm: Fire alarm components in ceiling system.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.

C. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

F. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2019.

G. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2017.

H. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples 3" x 3" inch in size illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, 3" inches long, of suspension system main runner, cross runner, and perimeter molding.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.06 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com
   2. USG Corporation: www.usg.com/ceilings
   3. Substitutions: See Section 01 60 00 - Product Requirements.

C. Suspension Systems:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com
   2. USG Corporation: www.usg.com/ceilings

2.02 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Rating: Determined in accordance with test procedures in ASTM E119 and complying with the following:
   1. UL (FRD) Assembly Design No. ____.

B. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
   1. Local authorities having jurisdiction.

2.03 PRODUCTS

A. Acoustical Panels (AC1): Mineral fiber with membrane-faced overlay, with the following characteristics:
   1. Classification: ASTM E1264 Type IV, Class A
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. NRC Range: .85 determined in accordance with ASTM E1264.
   5. Articulation Class (AC):170, determined in accordance with ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 35 determined in accordance with ASTM E1264.
   7. Tile Edge: as indicated on drawings.
   8. Color: As indicated on drawings.
   9. Suspension System Type: as indicated on drawings.
   10. Armstrong World Industries, Inc; Calla: www.armstrongceilings.com

B. Acoustical Panels (AC2): Mineral fiber with membrane-faced overlay, with the following characteristics:
   1. Classification: ASTM E1264 Type IV, Class A
   2. Size: varies refer to Reflected Ceiling Plan
   3. Thickness: 3/4 inch.

4. NRC Range .90 determined in accordance with ASTM E1264.
5. Articulation Class (AC): 190, determined in accordance with ASTM E1264.
6. Ceiling Attenuation Class (CAC): 35+ determined in accordance with ASTM E1264.
7. Tile Edge: as indicated on drawings.
8. Color: As indicated on drawings.
9. Suspension System Type: as indicated on drawings.
10. Armstrong World Industries, Inc; Lyra: www.armstrongceilings.com

2.04 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

2.05 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12-gage 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

E. Perimeter Moldings: Same metal and finish as grid.

F. Metal Edge Trim for "Cloud" Suspension Systems: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.

G. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:

1. Make field cut edges of same profile as factory edges.

END OF SECTION

SECTION 09 54 26
SUSPENDED WOOD CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood ceiling panels.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Site finishing.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed.

B. Do not install ceiling until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components and ceiling panels.

C. Samples: Submit two samples illustrating material and finish of ceiling panels.

D. Samples: Submit two samples each, 3 inches long, of suspension system main runner, cross runner, and perimeter molding.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Ceiling Panels: Provide five standard size panels.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum per manufacturer's recommendation degrees F during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Suspended Wood Ceilings:
   1. Armstrong Ceiling Products; As Indicated on Finish Legend
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SUSPENDED WOOD CEILING SYSTEM

A. Suspension System: Solid wood construction framing with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
   1. Species: per Manufacturers standard options

B. Woodworks Grille (SWC): Pre-assembled solid wood slat system with Backer & Dowel.
   1. Size: As indicated on drawings

C. Trim and Corner Medallions: Solid wood construction, species to match suspension system.

D. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

E. Finish: Color to be selected by Architect.

2.03 FABRICATION

A. Shop fabricate components.

B. Prepare components for mechanical and electrical openings as required and as shown on shop drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION

A. Install wall trim and corner medallions in accordance with manufacturer's installation instructions.

B. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

C. Locate system on room axis according to reflected ceiling plan.

D. Support ceiling grid using clips and hanger wires spaced at maximum 48 inches on center.

E. Cutting Panels and Grid Components: Using a sharp, small blade saw and straight edge, mark the finish side and cut as required. Miter cut corners.

F. Install border and edge panels, then full panels working across the room.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Resilient stair accessories.

D. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

C. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

D. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Grounding and bonding of static control flooring to building grounding system.

1.03 REFERENCE STANDARDS

A. ASTM D6329 - Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers; 1998 (Reapproved 2015).

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

C. ASTM E492 - Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine; 2009, with Editorial Revision (2016).

D. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.

E. ASTM F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring; 2006 (Reapproved 2018).

F. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2019.

G. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2017.

H. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2018).

I. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing; 2004 (Reapproved 2014).

J. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2018a.

K. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

L. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

M. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015, with Editorial Revision (2016).

N. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.

O. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2019.

P. NSF 332 - Sustainability Assessment for Resilient Floor Coverings; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Verification Samples: Submit two samples, 4 by 4 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra flooring Material: 5% of each type & color
   3. Extra Wall Base: 5% of each type & color
   4. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile – Type (LVT-1) Solid vinyl with color and pattern throughout thickness.
   1. Manufacturers:
      a. Mannington Commercial
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
   4. Size: as indicated in finish legend

5. Installation: floating
6. Total Thickness 6mm
7. Color: As indicated on drawings.

B. Vinyl Tile – Type (LVT-2) Solid vinyl with color and pattern throughout thickness.
1. Manufacturers:
   a. Mannington Commercial
2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
4. Size: as indicated in finish legend
5. Total Thickness: 2.5mm
6. Installation: Glue-Down with acoustical underlayment per manuf. recommendations
7. Color: As indicated on drawings.

C. Rubber Tile - Type (RBR): Homogeneous, color and pattern throughout thickness.
1. Manufacturers:
   a. Johnsonite, a Tarkett Company; www.johnsonite.com
2. Minimum Requirements: Comply with ASTM F1344, of Class corresponding to type specified.
3. Size: 18 by 18 inch nominal.
4. Total Thickness: 3/8 inch.
5. Installation: Monolithic, interlocking shape, loose-laid
6. Color: As indicated on drawings.

2.02 STAIR COVERING

A. Stair Tread & Riser Solution: Type (RF-1 & RF-2) Rubber; full width and depth of stair tread in one piece; tapered thickness.
1. Manufacturers:
   a. Johnsonite, a Tarkett Company; www.johnsonite.com
2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
3. Minimum Requirements: Comply with ASTM F2169, Type TP, rubber, thermoset.
4. Minimum Requirements: Comply with ASTM F2169, Type TV, vinyl, thermoplastic.
5. Minimum Requirements: Comply with ASTM F1700, of Class III, Type B.
6. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
7. Nosing: as indicated on drawings.
8. Color: As indicated on drawings.
9. Thickness: 1/8 inch

B. Stair Nosings: 1-1/2 inch horizontal return, 1-1/8 inch vertical return, full width of stair tread in one piece.
1. Material: Rubber.

2.03 RESILIENT BASE

A. Resilient Base – (Type RB-1): ASTM F1861, Type TS rubber, vulcanized thermoset;
1. Height: 4.25 inch.
2. Thickness: 1/8 inch.
3. Finish: Standard
4. Profile: Perceptions / Flex

B. Resilient Base – (Type RB-2): ASTM F1861, Type TS rubber, vulcanized thermoset;
1. Height: 6 inch.
2. Thickness: 0.125 inch.
3. Finish: Satin

4. Profile: Millwork / Reveal with quarter round shoe-molding

C. Resilient Base – (Type VB-1): ASTM F1861, Type Vinyl,; top set Style B, Cove.
   1. Height: 4 inch.
   2. Thickness: 0.125 inch.
   3. Finish: Standard
   4. Profile: Traditional, Rolled

2.04 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Adhesive for Vinyl Flooring:

C. Moldings, Transition and Edge Strips: Same material as flooring.
   1. Manufacturers:
      a. Johnsonite, a Tarkett Company; www.johnsonite.com.

D. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 26 05 26 for grounding and bonding to building grounding system.
   2. Fit joints and butt seams tightly.
   3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Loose-Laid Installation: Set flooring in place in accordance with manufacturer's instructions.

E. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

F. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.
2. Resilient Strips: Attach to substrate using adhesive.

G. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

H. Install flooring in recessed floor access covers, maintaining floor pattern.

I. At movable partitions, install flooring under partitions without interrupting floor pattern.

3.04 INSTALLATION - SOUND CONTROL UNDERLAYMENT

A. Install in accordance with underlayment manufacturer's instructions.

3.05 INSTALLATION - SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

B. Coved Base: Install as detailed on drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

3.06 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install square tile to as indicated on drawings pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Install loose-laid tile, fit interlocking edges tightly.

E. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.07 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.08 INSTALLATION - STAIR COVERINGS

A. Adhere over entire surface. Fit accurately and securely.

3.09 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.10 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Installation accessories:
   1. Adhesives.
   2. Finishes and cleaners.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: SCS FloorScore certification documentation.

B. Section 01 74 19 - Construction Waste Management and Disposal.

C. Section 07 92 00 - Joint Sealants.

D. Section 07 95 13 - Expansion Joint Cover Assemblies.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2019.

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings.

C. Manufacturer's documentation for flooring and accessories:
   1. Technical Data.
   2. Installation and Maintenance.
   3. Warranty.

D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Verification Samples: Submit two samples, 4 by 4 inch in size illustrating color and pattern for each resilient flooring product specified.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and that the material is of the correct style, color, quantity and run number(s).

B. Store all materials flat and off of the floor in an acclimatized, weather-tight space between 65 to 85 degrees F.

C. Do not double stack pallets.

1.06 FIELD CONDITIONS

A. Acclimate material at jobsite between 65 to 85 degrees F and 35 percent to 85 percent relative humidity for 48 hours prior to installation. Temperature and relative humidity should also be maintained at the same levels during installation, and after installation.

B. Keep away from heating and cooling ducts and direct sunlight.

C. If permanent HVAC is not operational, temporary means should be used to maintain the recommended temperature and relative humidity levels.

D. Close areas to traffic during installation of flooring and accessories.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

B. Installer Qualifications: Aspecta® Five should only be installed by professional flooring contractors that have demonstrated successful installations of jobs in similar size and scope.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Mannington Commercial; Amtico Collection: www.manningtoncommercial.com

2.02 RESILIENT TILE FLOORING

A. Luxury Vinyl Plank and Tile: LVT-1
   1. Pattern: As indicated on drawings.
   2. Luxury Vinyl Plank and Tile: LVT-1
   3. Luxury Vinyl Plank and Tile: LVT-3

2.03 ACCESSORIES

A. Moldings, Transition and Edge Strips: Same material as flooring.

B. Adhesives: per manufacturers recommendations

PART 3 EXECUTION

3.01 EXAMINATION - SEE ALSO SECTION 01 7000.

A. Install flooring and accessories after other operations (including painting) have been completed.

B. Acceptance of Conditions: Carefully examine all installation areas with installer/applicator present, for compliance with requirements affecting work performance.
   1. Verify that field measurements, product, adhesives, substrates, surfaces, structural support, tolerances, levelness, temperature, humidity, moisture content level, pH, cleanliness and other conditions are as required by the manufacturer, and ready to receive work.

C. Verify that substrate is contaminant-free.

D. Test substrates as required by manufacturer to verify proper conditions exist.
   1. Concrete:
      a. Check for concrete additives such as fly ash, curing compounds, hardeners, or other surface treatments that may prevent proper bonding of floor coverings.
      b. Moisture testing: Perform either the In-Situ Relative Humidity (RH) test (ASTM F2170) or Moisture Vapor Emission Rate (MVER) test (ASTM F1869). Refer to the Manufacturer's Installation Guide/Manual for the maximum allowable substrate moisture content. Substrates above the maximum allowable moisture content will require a moisture mitigation system.
      c. Perform alkalinity testing per ASTM F710 to verify pH level is between 7 to 10.
      d. Check substrate for absorbency per manufacturer's recommendations.
      e. Perform bond testing per ASTM F710 to determine compatibility of adhesive to concrete substrate.
   2. Wood:

a. Shall be dry, clean, structurally sound and installed per underlayment manufacturer's installation instructions.
b. Test wood subfloors and underlayment panels using a suitable wood moisture pin-meter. Readings between the subfloor and underlayment panels should be within 3 percent prior to installing the underlayment panels.
c. The maximum moisture content is 14 percent.
d. Proceed with installation only after satisfactory conditions have been met.
e. Verify that proper gypcrete or other underlayment is installed for installation of finished floor material per manufacturer's specifications.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prior to installation, the flooring installer should plan and attend an on-site construction meeting with the General Contractor, Architect to review all requirements and inspect site conditions as outlined in the manufacturer's installation document, as well as to review the requirements of ASTM F710 and any relevant building codes, or local, state, or national regulations.

B. Flooring installation should not begin until all site conditions have been assessed, testing has been completed and subfloor conditions have been approved.

C. Prepare per manufacturer's written instructions, Section 01 70 00, and as follows:
1. Prepare substrates to ensure proper adhesion of Luxury Vinyl Plank & Tile.
2. Concrete Substrates: Prepare substrate per ASTM F710.
a. Verify that subfloor is clean, flat, smooth, free of dirt, rust, paint, oil, wax or any contaminant that will interfere with adhesive bonding.
b. Expansion joints, isolation joints, or other moving joints must be honored and must not be filled with underlayment products or other materials, and floor coverings must not be laid over them. Expansion joint covering systems should be detailed by the architect or engineer, and based upon intended usage and aesthetic considerations.
c. Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities shall be filled or smoothed with high-quality Portland cement or calcium aluminate based patching or underlayment compound for filling or smoothing, or both.
1) Do not skim-coat large areas with patching compound, especially slick power-troweled surfaces.
2) Sand smooth per manufacturer's instructions.
d. Slick surfaces such as power-troweled concrete shall be profiled as needed to allow for a mechanical bond between the adhesive and subfloor.
e. Do not use gypsum-based underlayment products and do not skim coat concrete subfloors.
f. Self-Leveling Underlayments: Provide a dry and smoothly-sanded underlayment substrate ready for installation of Luxury Vinyl Plank & Tile. Underlayment compound shall be moisture-resistant, mildew-resistant, and alkali-resistant and must have a minimum of 3,000 psi compressive strength per ASTM C109/C109M.
g. Lightweight concrete shall have a compressive strength greater than 90 pounds per cubic foot with minimum compression strength of 2,500 psi or greater.
3. Wood Substrates or Panel Type Underlayment:
a. Wood subfloors require an underlayment (double layer construction) with a minimum total thickness of 1 inch and minimum of 18 inches of well ventilated space beneath.
1) Crawl spaces shall be insulated and protected by a vapor barrier.
b. Use minimum 0.25 inch thick APA-rated underlayment grade plywood with a fully sanded face or other underlayment panel that is appropriate for the intended usage. Install and prepare panels and seams according to the manufacturer's instructions.
4. Other Substrates:

a. Refer to manufacturer's professional installation guide and/or contact manufacturer, as special conditions may exist.

3.03 INSTALLATION

A. Installation per manufacturer's written instructions, Section 01 70 00, and as follows:
   1. Layout shall be specified by Architect, Designer and as indicated on drawings
   2. Follow layout and ensure installation reference lines are square.
   3. Field tiles shall be installed with directional arrows on back aligned in the same direction, or may be installed in quarter-turned fashion.
   4. Check cartons for and do not mix dye lots.
   5. Expansion Joints: Locate expansion, isolation, and other moving joints prior to installation.
      a. Do not fill expansion, isolation, and other moving joints with patching compound nor cover with resilient flooring.
      b. Install movement joint systems per manufacturer's instructions and per Section 07 92 00 and Section 07 95 13.
   6. Adhesives: Adhere flooring to substrate using the full spread method resulting in a completed installation without gaps, voids, raised edges, bubbles or any other surface imperfections.
      a. Select appropriate adhesive, trowel and follow manufacturer's instructions.
      b. Periodically spot-check transfer of adhesive to back of tile during installation.
      c. Roll floor with a 100 pound roller to ensure proper transfer of adhesive and bonding.
      d. Protect floor from traffic per manufacturer's instructions.
      e. Do not wet mop floor until the adhesive has properly set per written instructions.

3.04 FIELD QUALTITY CONTROL

A. Site tests and inspections per Section 01 40 00 and as follows:
   1. Inspect flooring installation for non-conforming work including (but not limited to) the following:
      a. Lack of adhesion.
      b. Bubbles, loose tiles or raised edges.
      c. Dirt and debris underneath flooring.
      d. Excessive gaps.
      e. Improper substrate preparation (as indicated by telegraphing).
      f. Damage to tiles, including: dents/indentations, cuts, cracks, burns or punctures.

B. Non-conforming work per General Conditions and as follows:
   1. Repair or replace damaged material if not acceptable to the Architect.

3.05 CLEANING

A. Waste Management per Section 01 70 00 and Section 01 74 19, and as follows:
   1. Coordinate material reclamation program with manufacturer, if applicable.
      a. Store and return cartons and pallets to manufacturer or recycler for reuse or recycling.

B. Provide progress cleaning per manufacturer's written instructions, Section 01 70 00, and as follows:
   1. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
      a. Clean and protect completed construction until Date of Substantial Completion.
      b. During installation, remove wet adhesive from surface of flooring per manufacturer's instructions.
   2. Site: Maintain project site free of waste materials and debris.

C. Provide final cleaning immediately prior to Date of Substantial Completion inspection per manufacturer's written instructions and Section 01 70 00.

1. Protection: Remove manufacturer's and other installed protection immediately prior to Date of Substantial Completion inspection, unless required otherwise.

3.06 MAINTENANCE

A. Initial maintenance per flooring manufacturer's written instructions and as follows:
   1. Allow the adhesive to cure for at least 48 hours prior to wet cleaning the floor.
   2. Sweep, dust mop or vacuum the floor thoroughly to remove all loose dirt, dust, grit and debris. Do not use vacuums with a beater bar assembly.
   3. Remove any dried adhesive residue from the surface with mineral spirits applied to a clean, lint-free cloth.
   4. Damp mop the floor using a cleaner recommended by the flooring manufacturer.
   5. If necessary, scrub the floor using an auto scrubber or rotary machine (300 rpm or less) with a cleaner recommended by the flooring manufacturer. Maintain the proper dilution ratio and use the appropriate scrubbing brush or pad.
   6. Thoroughly rinse the entire floor with fresh, clean water. Remove the dirty residue with a wet-vacuum or clean mop and allow the floor to dry completely.

3.07 PROTECTION

A. Protect materials from construction operations until Date of Substantial Completion or Owner occupancy, whichever occurs first.
   1. Protect finished floor from abuse and damage by using heavy non-staining kraft paper, drop cloths or equivalent. Use additional, non-damaging protective materials as needed.
   2. Light foot traffic on a newly installed floor can be permitted after 24 hours.
   3. Keep heavy traffic and rolling loads off the newly installed LVT flooring for 48 hours.
   4. Protect the floor from rolling loads by covering with protective boards.

END OF SECTION

SECTION 09 65 66

RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rubber tile, adhesively installed.

B. Interlocking, loose-laid rubber tile.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

C. Section 09 05 61 - Common Work Results for Flooring Preparation: Cleaning, and preparation.

D. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

E. Section 09 65 00 - Resilient Flooring.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2019.

B. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification; 2006.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Selection Samples: Manufacturer's color charts for flooring materials specified, indicating full range of colors and textures available.

E. Verification Samples: Actual flooring material specified, not less than 12 inch square, mounted on solid backing.

F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer certified in writing by the flooring manufacturer to be qualified for installation of specified flooring system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

PART 2 PRODUCTS

2.01 PREFORMED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.
   1. Mannington Commercial; manningtoncommercial.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Rubber Tile Flooring: Recycled vulcanized rubber and colored granules.
   1. Thickness: Minimum 5/16 inch.
   2. Tile Edge/Installation: Interlocking shape, loose-laid installation.
   3. Size, Straight Edge Tile: Nominal 24 inches by 24 inches.
   4. Surface Texture: Smooth.
   5. Color: As selected from manufacturer's standard range.

2.02 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
   2. Follow moisture and alkalinity remediation procedures in Section 09 05 61.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius.

C. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

D. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Rubber Tile Flooring:
   1. Lay out center lines in spaces to receive tile flooring, based on location of principal walls. Start tile installation from center, and adjust as necessary to avoid tiles less than one-half width at perimeter.
   2. Lay tiles square with room axis, matching for color and pattern by selecting from cartons and mixing as recommended by manufacturer.
   3. Install loose-laid tile in a staggered pattern, fit interlocking edges tightly.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

C. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

D. Section 26 05 19.13 - Undercarpet Electrical Power Cables: Undercarpet flat wiring.

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016.

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2019.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.

F. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints.

D. Samples: Submit one carpet tiles illustrating color and pattern design for each carpet color selected.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

G. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Mohawk Group; www.mohawkgroup.com
   2. Mannington www.manningtoncommercial.com

2.02 MATERIALS

A. Tile Carpeting, Type (WOC): Tufted, manufactured in one color dye lot.
   1. Color, Style, Size: as indicated on drawings.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum, color as selected by architect

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.

C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Fully adhere carpet tile to substrate.

F. Trim carpet tile neatly at walls and around interruptions.

G. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 80 00

GYPSUM CEMENT UNDERLAYMENT

RECOMMENDED SPECIFICATION FOR GYP-CRETE FLOOR UNDERLAYMENT IN MULTI-FAMILY HOUSING

PART 1 GENERAL

1.01 SUMMARY

A. Description of Work: Work of this section includes underlayment for interior finish flooring and is not limited to the following:
   1. Maxxon Gyp-Crete Floor Underlayment covering normal project conditions and applications.
   2. Division 3 Section-Concrete: “Cast Underlayment” and “Gypsum Cement Underlayment”
   3. Division 9 Section-Finishes: “Acoustic Treatment”

1.02 REFERENCES

A. Underwriters Laboratory — Fire Resistance Volume 1 www.ul.com

B. GREENGUARD Certified — GREENGUARD and GREENGUARD Gold Certified www.greenguard.org

C. ASTM E336 and E1007 — Field Sound Transmission Class (F-STC), Field Impact Insulation Class (F-IIC)

D. ASTM E90 and E492 — Sound Transmission Class (STC), Impact Insulation Class (IIC)

E. ASTM C472M — Compressive strength of gypsum concrete

F. ASTM F2170 — Standard Test Method for Determining Relative Humidity in Concrete Floor Slab

G. ASTM F2419 — Standard Test Method for Installation of Thick Poured Gypsum Concrete and Preparation of Surface to Receive Resilient Flooring

H. ASTM F2678 — Standard Practice for Preparing Panel Underlayments, Thick Poured Lightweight Cellular Concrete Underlayments, and Concrete Subfloors with Underlayment Patching Compounds to Receive Resilient Flooring

I. TCNA F 180 — Tile Council of North America Installation Handbook www.tileusa.com

J. NWFA — National Wood Flooring Association Instructions www.nwfa.org

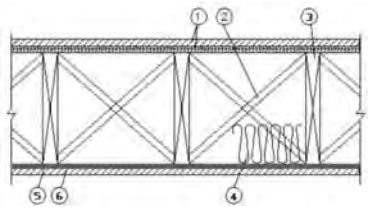
K. Finished Floor Goods Procedures — Maxxon Procedures for Attaching Finished Floor Goods to Maxxon Underlayments
www.maxxon.com

1.03 SUBMITTALS

A. Product Data: Submit sale sheets *Gyp-Crete Sales Sheet*, *Acousti-Mat Ultimate Sound Control Systems*, *Acousti-Mat Perimeter Isolation Strip Spec Sheet, Procedures for Attaching Finished Floor Goods to Maxxon Underlayments*, and *Maxxon's Building Conditions Guide* with project materials clearly identified for each required product or system.

B. UL Directory Fire Resistance Volume 1 - Architect to utilize one or more of the following:

Rating	Underwriters Laboratory File Number
1 Hr Fire Rating	L593
2 Hr Fire Rating	L505, L511, L536, L541



Example: L593

C. Acoustical Data: Submit sound tests according to IBC code criteria ASTM E492 (IIC) and ASTM E90 (STC) or ASTM E1007 (F-IIC) and E336 (F-IIC).

D. Code Approvals: See www.maxxon.com for the current list of code approvals.

1.04 SYSTEM REQUIREMENTS

A. Performance Requirements:

1. Gyp-Crete Floor Underlayment (An Eco-Friendly Building Product)
   i) Compressive strength up to 2,200 psi (up to 15.2 MPa)
   ii) Density 110 pounds per cubic foot (1,762 kg/m^3)

*****Note: The following is for 2009 IBC Acoustical Requirements Section 1207*****

2. Sound Control – 2009 International Building Code: Section 1207.2 & .3
   i) Minimum Sound Transmission Class, 50 STC (45 if field tested) – Section 1207.2
      (1) ASTM E90 and E336
   ii) Minimum Impact Insulation Class, 50 IIC (45 if field tested) – Section 1207.3
      (1) ASTM E492 and E1007

1.05 QUALITY ASSURANCE

A. Performance Standards:

1. All materials, unless otherwise indicated, shall be manufactured by Maxxon Corporation and shall be installed in accordance with its current printed directions and by a Maxxon Corporation Authorized Applicator.
2. Underlayment mix shall be tested for a slump using a 2" (i.d.) x 4" (50 mm x 101 mm) cylinder resulting in a patty size of 8 1/2" (216 mm) plus or minus 1 inch (25 mm) diameter.
3. Compressive strength tested in accordance with ASTM C472M.

1.06 DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered in their original unopened packages and protected from damage and exposure from the elements. Damaged or deteriorated materials shall be removed from the premises.

1.07 PROJECT CONDITIONS

A. Before, during and after installation of product, building interior shall be enclosed, with adequate ventilation and heat maintained at a temperature above 50 °F (10 °C) to allow for drying of product.

PART 2 GENERAL

2.01 PRODUCTS AND MANUFACTURERS

A. Manufacturer: Maxxon Corporation, Hamel, MN. Telephone: (800) 356-7887

2.02 MATERIALS

A. Proprietary products/systems: Poured flooring underlayment and topping products, including the following:
   1. Gyp-Crete Floor Underlayment

   *****Note: The following is for 2009 IBC Acoustical Requirements Section 1207*****

B. Proprietary products/systems: Optional Sound Control that does not negate the fire rating and is specified in UL design. Acoustical performance is dependent on system design and construction.
   1. Acousti-Mat® LP Sound Mat
   2. Acousti-Mat® LPR Sound Mat
   3. Acousti-Mat® I Sound Mat
   4. Acousti-Mat® II Sound Mat
   5. Acousti-Mat® II HP Sound Mat
   6. Enkasonic® Sound Mat
   7. Enkasonic® HP Sound Mat
   8. Acousti-Mat® 3 Sound Mat
   9. Acousti-Mat® 3 HP Sound Mat

C. Maxxon Acousti-Mat Perimeter Isolation Strips as manufactured by Maxxon Corporation, Hamel, MN

D. Maxxon Acousti-Mat Tape as manufactured by Maxxon Corporation, Hamel, MN

E. Maxxon Floor Primer:
   1. Material Standard: Comply with specifications outlined in manufacturer's Design and Installation Guide for wood.

F. Mix Water:
   1. Material Standard: Potable, free from impurities and from a domestic source.

G. Sand Aggregate:
   1. Sand shall meet Maxxon Sand Specification 101.

H. Maxxon Overspray Primer Sealer:
   1. Seal all areas that receive glue down floor goods with Maxxon Overspray according to manufacturer's specifications.

I. Maxxon Acrylic Primer Sealer (Alternate to Overspray):
   1. Seal all areas that receive glue down floor goods with Maxxon Acrylic according to manufacturer’s specifications.

J. Maxxon Reinforcement or Maxxon CSM (Crack Suppression Mat):
   1. Install approved reinforcement as per manufacturer recommendations. For reinforcement requirements see page 5.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions:
   1. Installation shall not begin until the building is enclosed, including roof, windows, doors, and any other apertures.

2. Wood substrate shall be structurally sound, properly fastened, and dry. Contractor shall clean subfloor to remove mud, oil, grease, and other contaminating factors before arrival of the authorized applicator.
3. Wood substrate:
   i) The wood subfloor must be adequate to withstand live and dead loads with a deflection limitation of L/360.
   ii) Wood should be agency approved 23/32" (18 mm) T & G subfloor sheathing.

3.02 REQUIREMENTS

A. Leak Prevention:
   1. Fill cracks and voids in subfloor where leakage of slurry could occur.
B. Priming subfloor:
   1. Prime substrate according to manufacturer's recommendations.
C. Application:
   1. Install in accordance with reference standards and manufacturer's instructions.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Mixing Proportions:
   1. General Requirements: Mix proportions and methods shall be in strict accordance with product manufacturer recommendations.
B. Application:
   1. (Optional) Acousti-Mat Installations: Install Acousti-Mat following manufacturer's recommendations and specifications including installation of Perimeter Isolation Strips at the perimeter of all areas receiving Acousti-Mat (including doorframes) and around any protrusions through the installation. Adhere the foam perimeter isolation strip to the wall with Acousti-Mat Tape.
   2. Pour floor topping to recommended thickness. Immediately spread and screed product to a smooth surface. Expansion joints in all types of work shall be brought through the underlayment.
      i) Minimum Maxxon Underlayment Depth:

Substrate	Depth of Pour
Wood	¾" (19 mm)
Acousti-Mat LP	½" (13 mm)
Acousti-Mat LPR	¾" (19 mm)
Acousti-Mat I	¾" (19 mm)
Acousti-Mat II	1" (25 mm)
Acousti-Mat II HP	1" (25 mm)
Enkasonic	1" (25 mm)
Enkasonic HP	1" (25 mm)
Acousti-Mat 3	1 ½" (38 mm) reinforced
Acousti-Mat 3 HP	1 ½" (38 mm) reinforced

C. Drying:
   1. The general contractor must provide and maintain correct environmental conditions to keep the building clean and dry, and protect against infestation of moisture from a variety of potential sources. The general contractor must supply mechanical ventilation and heat if necessary to remove moisture from the area until the Gyp-Crete is dry.
   2. Protection from Heavy Loads: During construction, place temporary wood planking over Gyp-Crete wherever it will be subject to heavy wheeled or concentrated loads.

3.04 PREPARATION FOR INSTALLATION OF GLUE DOWN FLOOR GOODS

A. Sealing:

1. Seal all areas that receive glue down floor goods with Maxxon Overspray or Maxxon Acrylic according to the Maxxon Corporation's specifications. Any floor areas where the surface has been damaged shall be cleaned and sealed regardless of floor covering to be used. Where floor goods manufacturers require special adhesive or installation systems, their requirements supersede these recommendations.
2. Maxxon UWR can be used over Maxxon underlayments in low traffic areas such as utility rooms, storage rooms and closets, as a protective surface.

B. Moisture Testing:
1. Follow the respective floor goods manufacturers' recommendations for relative humidity requirements. When manufacturer does not have a relative humidity requirement, refer to Maxxon's *Procedures for Attaching Finished Floor Goods to Maxxon Underlayments* brochure.

C. Finished Floor Goods:
1. There are many reference standards for the installation procedures and recommendations for finished flooring applications over gypsum underlayments. These include instructions of the manufacturers of the finished flooring, adhesives and thin-set as well as national agency reference standards. The national standards are listed below:

Flooring Type	Reference Standard
Resilient	ASTM F2419
Ceramic Tile	TCNA F180
Wood	NWFA Instructions

See Maxxon Corporation's *Procedures for Attaching Finished Floor Goods to Maxxon Underlayments* brochure for guidelines for installing finished floor goods. This procedure is not a warranty and is to be used as a guideline only.

END OF SECTION

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Exposed surfaces of steel lintels and ledge angles.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   7. Glass.
   8. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 50 00 - Metal Fabrications: Shop-primed items.

C. Section 05 51 00 - Metal Stairs: Shop-primed items.

D. Section 09 91 23 - Interior Painting.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.06 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 4 feet long by 4 feet wide, illustrating paint color, texture, and finish.

C. Locate where directed by Architect.

D. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. PPG Paints; _____: www.ppgpaints.com/#sle.
   2. Sherwin-Williams Company; _____: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete masonry units, fiber cement siding, and primed metal.
   1. Two top coats and one coat primer.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali Resistant Water Based Primer; MPI #3.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Fiber Cement Siding: 12 percent.
   2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   3. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
   4. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:

G. Masonry:

H. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

I. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.

J. Asphalt, Creosote, or Bituminous Surfaces: Remove foreign particles to permit adhesion of finishing materials. Apply latex based sealer or primer.

K. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

L. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

M. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

N. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.

O. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.07 COLOR SCHEDULE

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Elevator pit ladders.
   3. Surfaces inside cabinets.
   4. Prime surfaces to receive wall coverings.
   5. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other tiles.
   9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   10. Glass.
   11. Concrete masonry units in utility, mechanical, and electrical spaces.
   12. Acoustical materials, unless specifically indicated.
   13. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 50 00 - Metal Fabrications: Shop-primed items.

C. Section 05 51 00 - Metal Stairs: Shop-primed items.

D. Section 09 91 13 - Exterior Painting.

E. Section 09 93 00 - Staining and Transparent Finishing: Wood substrates.

F. Section 09 96 00 - High-Performance Coatings.

G. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment: Painted identification.

H. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment: Color coding scheme for items to be painted under this section.

I. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Painted identification.

J. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Color coding scheme for items to be painted under this section.

K. Section 23 05 53 - Identification for HVAC Piping and Equipment: Painted identification.

L. Section 23 05 53 - Identification for HVAC Piping and Equipment: Color coding scheme for items to be painted under this section.

M. Section 26 05 53 - Identification for Electrical Systems: Painted identification.

N. Section 26 05 53 - Identification for Electrical Systems: Color coding scheme for items to be painted under this section.

O. Section 32 17 23.13 - Painted Pavement Markings: Painted pavement markings.

P. Section 33 16 00 - Water Utility Storage Tanks: Painting inside and outside of tanks.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2017).

D. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2018.

E. ASTM D4260 - Standard Practice for Liquid and Gelled Acid Etching of Concrete; 2005 (Reapproved 2017).

F. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.

B. Paints:
   1. PPG Paints: www.ppgpaints.com
   2. Sherwin-Williams Company: www.sherwin-williams.com
   3. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   4. Supply each paint material in quantity required to complete entire project's work from a single production run.
   5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
      b. Architectural coatings VOC limits of Tennessee.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.
   1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.
   2. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.03 PAINT SYSTEMS - INTERIOR

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

H. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.

I. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 93 00
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of stains and transparent finishes.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09 91 13 - Exterior Painting: Stains and transparent finishes for concrete substrates.

C. Section 09 91 23 - Interior Painting: Stains and transparent finishes for concrete substrates.

1.03 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category.

C. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

D. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Stain and Transparent Finish Materials: 1 gallon of each color and type; from the same product run, store where directed.
   3. Label each container with color and type in addition to the manufacturer's label.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperature: 50 degrees F unless required otherwise by manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Transparent Finishes:
   1. Sherwin-Williams Company: www.sherwin-williams.com

B. Stains:
   1. Sherwin-Williams Company: www.sherwin-williams.com

2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

A. Finishes:
   1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each finish material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

C. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of stains and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

E. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood surfaces lightly between coats to achieve required finish.

E. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

F. Reinstall items removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowance for signs.

B. Room and door signs.

C. Interior directional and informational signs.

D. Luminous egress path marking and other "glow-in-the-dark" signs.

E. Emergency evacuation maps.

F. Building identification signs.

G. Traffic signs.

1.02 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems.

B. Section 26 51 00 - Interior Lighting: Exit signs required by code.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 21 00 - Allowances, for cash allowances affecting this section.

B. Allowance amount covers purchase, delivery, and installation.

1.04 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from KCDC through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by KCDC through Architect prior to fabrication.

D. Samples: Submit one sample of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Curved Sign Media Suction Cups: One for each 100 signs; for removing media.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.08 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:
   1. Best Sign Systems, Inc; ____: www.bestsigns.com/#sle.
   2. Cosco Industries (ADA signs); ADA Series 1: www.coscoarchitecturalsigns.com/#sle.
   3. FASTSIGNS; _____: www.fastsigns.com/#sle.
   4. Mohawk Sign Systems, Inc; ____: www.mohawksign.com/#sle.
   5. Seton Identification Products; ____: www.seton.com/aec/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Curved Signs:

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 _____, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Character Height: TBD inch.
   4. Sign Height: TBD inches, unless otherwise indicated.
   5. Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings.
   6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings.
   7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
   8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.
   9. Apartments: Identify with room names and / or numbers to be determined later, not the numbers indicated on drawings.

C. Interior Directional and Informational Signs:
   1. Sign Type: Same as room and door signs.
   2. Allow for 30 signs 4 inches high by 16 inches long.
   3. Where suspended, ceiling mounted, or projecting from wall signs are indicated, provide two-sided signs with same information on both sides.

D. Emergency Evacuation Maps:
   1. Allow for one map per elevator lobby.

2. Map content to be provided by KCDC and Architect.

E. Building Identification Signs:
1. Use individual metal letters.
2. Mount on outside wall in location indicated on drawings.

F. Other Dimensional Letter Signs: Wall-mounted.

G. Traffic Signs: To match campus standards; locate where indicated on drawings.

2.03 SIGN TYPES

A. Radius / Curved Signs: One-piece, curved extruded aluminum media holder securing flat, flexible sign media by curved lip on two sides; other two sides closed by end caps; concealed mounting attachment.
1. Sizes: As indicated on drawings.
2. Finish: Natural (clear) anodized.
3. Sign Orientation: Curved in horizontal section.
4. Wall Mounting of One-Sided Signs: Mechanical anchorage, with predrilled holes, and set in clear silicone sealant.
5. Wall and Ceiling Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.
6. Suspended Mounting: Stainless steel suspension cables, cable clamps, and ceiling fastener suitable for attachment to ceiling construction indicated.

B. Color and Font: Unless otherwise indicated:
1. Character Font: Helvetica, Arial, or other sans serif font.
2. Character Case: Upper case only.
3. Background Color: Clear.
4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
1. Total Thickness: 1/16 inch.

2.05 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Exposed Screws: Finished to coordinate with signage where indicated and not concealed screws.

C. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

B. Protective wall covering.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.

C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two sections of corner guards, bumper rails, and protective corridor handrails, 24 inches long.
   2. Submit two samples of protective wall covering and door surface protection, 6 by 6 inches square.

D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in KCDC's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project:
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Stock Materials: One package(s) of minimum 96 inches long unit of each kind of covers for corner guards, bumper rails, and protective corridor handrails.

G. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Protective Wall Panels: Fiber Reinforced Laminate (FRP):
   1. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PRODUCT TYPES

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

C. Verify that substrate surfaces for adhered items are clean and smooth.
   1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.

D. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard at top of baseboard inch above finished floor to 72 inches high.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 28 00

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Residential toilet, shower, and bath accessories.

C. Under-lavatory pipe supply covers.

D. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 83 00 - Mirrors: Other mirrors.

B. Section 09 30 00 - Tiling: Ceramic washroom accessories.

C. Section 22 40 00 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 ABBREVIATIONS AND ACRONYMS

A. PPE: Personal Protective Equipment.

1.04 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2017).

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM C1036 - Standard Specification for Flat Glass; 2016.

E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

F. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. Bradley Corporation; _____: www.bradleycorp.com/#sle.
   2. Georgia-Pacific Professional; _____: www.blue-connect.com/#sle.

3. Bobrick Washroom Equipment, Inc; https://www.bobrick.com/.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Residential Toilet, Shower, and Bath Accessories:
1. Bobrick Washroom Equipment, Inc; https://www.bobrick.com/.
2. Substitutions: Section 01 60 00 - Product Requirements.

C. Under-Lavatory Pipe Supply Covers:
1. Plumberex Specialty Products, Inc; _____: www.plumberex.com/#sle.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide toilet paper dispenser, soap dispenser and paper tower dispenser keys for each accessory to KCDC; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

E. Adhesive: Two component epoxy type, waterproof.

F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, stainless steel, spindleless type for tension spring delivery designed to prevent theft of tissue roll.
1. Products:
a. Bobrick B-4288.
b. Substitutions: Section 01 60 00 - Product Requirements.

B. Paper Towel Dispenser: Folded paper type, stainless steel, semi-recessed, with viewing slots on sides as refill indicator and tumbler lock.
1. Capacity: 300 C-fold minimum.
2. Products:
a. Bobrick: B-72974.
b. Substitutions: Section 01 60 00 - Product Requirements.

C. Waste Receptacle: Stainless steel, freestanding style with swing top.
1. Liner: Removable, heavy-duty vinyl liner, attached at a minimum of four points with stainless steel grommets and hooks.
2. Minimum capacity: 10 gallons.
3. Products:
a. Bobrick.
b. Substitutions: Section 01 60 00 - Product Requirements.

D. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
1. Products:
a. Bobrick: B-26607.

E. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.

1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
2. Size: Per drawings.
3. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
4. Products:
   a. Bobrick.
   b. Substitutions: Section 01 60 00 - Product Requirements.

F. Grab Bars: Stainless steel, smooth surface.
1. Standard Duty Grab Bars:
   a. Push/Pull Point Load: 250 pound-force, minimum.
   b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
   c. Finish: Satin.
   d. Length and Configuration: As indicated on drawings.
   e. Products:
      1) Seachrome Corporation: www.seachrome.com/#sle.
      2) Bobrick.

2.05 RESIDENTIAL TOILET, SHOWER, AND BATH ACCESSORIES

A. Toilet Paper Holder: Surface mounted, single roll, concealed attachment.
1. Material: Stainless steel; satin finish.
2. Products:
   a. Bobrock: B-685.
   b. Substitutions: Section 01 60 00 - Product Requirements.

B. Towel Bar: Round tubular bar; rectangular mounting posts, concealed attachment.
1. Length: 24 inches.
2. Products:
   a. Bobrick: B-674 x 24.

C. Shower Curtain Rod: Straight tube, 1 inch diameter, with mounting flanges for concealed attachment.
1. Material: Stainless steel; satin finish.
2. Length: per drawings inches.
3. Products:
   a. Bobrick: B-6047.
   b. Substitutions: Section 01 60 00 - Product Requirements.

D. Robe Hook: Single-prong, concealed attachment.
1. Material: Stainless steel; satin finish.
2. Products:
   a. Bobrick.
   b. Substitutions: Section 01 60 00 - Product Requirements.

E. Folding Shower Seat: Wall mounted recessed; welded tubular seat frame, structural support members, hinges and mechanical fasteners of Type 304 stainless steel. Refer to plans for right hand or left handed seat, size and locations:
1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected by architect.
2. Size: ADA Standards compliant
3. Product: G-3040H by Guardian Easy Care

2.06 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:

1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible PVC.
   a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   b. Comply with ASTM C1822, type indicated.
   c. Comply with ASME A112.18.9.
   d. Comply with ICC A117.1.
   e. Microbial and Fungal Resistance: Comply with ASTM G21.
4. Color: White.
5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
6. Products:
   a. Plumberex Specialty Products, Inc; Plumberex Handy-Shield Maxx: www.plumberex.com/#sle.
   b. Plumberex Specialty Products, Inc; Plumberex Trap Gear: www.plumberex.com/#sle.
   c. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 UTILITY ROOM ACCESSORIES

A. Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
   1. Holders: Three spring-loaded rubber cam holders.
   2. Length: 36 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

D. Verify that field measurements are as indicated on drawings.

E. Provide blocking, reinforcing plates and concealed anchors in walls as required to hang accessories and plumbing fixtures.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars: As indicated on drawings.
   2. Other Accessories: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

B. FM (AG) - FM Approval Guide; current edition.

C. NFPA 10 - Standard for Portable Fire Extinguishers; 2017, with Errata (2018).

D. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Ansul, a Tyco Business; ____: www.ansul.com/#sle.
   2. Nystrom, Inc; _____: www.nystrom.com/#sle.
   3. Pyro-Chem, a Tyco Business; _____: www.pyrochem.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Ansul, a Tyco Business; _____: www.ansul.com/#sle.
   2. Larsen's Manufacturing Co; _____: www.larsensmfg.com/#sle.
   3. Nystrom, Inc; _____: www.nystrom.com/#sle.
   4. Pyro-Chem, a Tyco Business; _____: www.pyrochem.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Finish: .

B. Water Type Fire Extinguishers: Stainless steel tank, pressurized, with premixed antifreeze solution, including hose and nozzle.
   1. Class: 2-A type.
   2. Size: 2.5 gallon.
   3. Finish: .
   4. temperature Range: Minus 40 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.

C. Fire Rated Cabinet Construction: One-hour fire rated.

D. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.
   2. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

E. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.

F. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

H. Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Lettering: “FIRE EXTINGUISHER” decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, ____ inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

3.03 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

3.04 MAINTENANCE - SELF-SERVICE FIRE EXTINGUISHERS

A. Monthly Inspections: Inspect self-service fire extinguishers on monthly basis in accordance with manufacturer’s instructions, and requirements of the authorities having jurisdiction (AHJ).

B. Annual Inspections: Inspect self-service fire extinguishers on annual basis in accordance with manufacturer's instructions, and requirements of the authorities having jurisdiction (AHJ).

C. Inspection Certification Tag: Provide new tag indicating acceptable condition of fire extinguisher, date of inspection, and name of self-service inspector for each inspection.

3.05 SCHEDULES

A. Apartment Units: Provide (1) surface mounted fire extinguisher in each apartment per fire marshals direction. Provide hanging bracket as required to hang fire extinguisher.

B. Public amenities: Provide semi-recessed fire extinguisher cabinet and fire extinguisher per fire marshals direction and within 75'-0" radius

C. Corridors and enclosed "breezeways": Provide semi-recessed fire extinguisher cabinet and fire extinguisher per fire marshal's direction and withing 75'-0" radius.

END OF SECTION

SECTION 10 51 43

WIRE MESH STORAGE LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tenant storage lockers.

1.02 RELATED REQUIREMENTS

A. 10 22 13 - Wire Mesh Partitions: Large wire mesh storage enclosures.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.

D. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2018.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

F. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes, and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan.

D. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wire Mesh Storage Lockers:
   1. Folding Guard Corporation; ____: www.foldingguard.com/#sle.
   2. Spaceguard Products; ____: www.spaceguardproducts.com/#sle.
   3. WireCrafters LLC; _____: www.wirecrafters.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOCKER APPLICATIONS

A. See Section 10 22 13 for wire mesh partitions used to create walk-in spaces.

B. Tenant Storage Lockers: Wire mesh lockers, floor-anchored.
   1. Unit Sizes:
      a. Width: per drawings inches.
      b. Depth: per drawings inches.
      c. Height: 72 inches.
   2. Configuration:
      a. Vertical: Single tier.
      b. Units: Manufacturer's standard starter and add-on units; Single row with shared side walls.
   3. Components:
      a. Front Panels: Framed door panel.
         1) Doors: Same mesh and framing as wall panels. Factory pre-hung.

(a) Width: Full-width of locker.
(b) Height: Full-height of locker.

b. Side Panels: Welded wire mesh with welded steel angle frame.
c. Backs: Sheet metal.
d. Shelves: Sheet metal.
e. Tops: Individual; Same mesh and framing as wall panels; Flat.
f. Floors: Sheet metal. Attached to and supported by locker frame.

4. Locking: Built-in key cylinder locks with knobs.

2.03 WIRE MESH STORAGE LOCKERS

A. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. Wire Mesh Lockers: Factory assembled, welded construction, modular assemblies of panels, doors, anchors, hardware, and accessories as required to provide a complete system.

2.04 MATERIALS AND COMPONENTS

A. Woven Wire Mesh: Standard duty.
1. Material: ASTM A510/A510M uncoated crimped steel wire.
2. Wire Size: 10 gage, 0.135 inch.
3. Mesh Opening Size: 1-1/2 inch diamond shape.
4. Mesh Opening Size: 1 inch by 2 inch rectangular shape.

B. Framed Panels:

C. Doors: Same material as partitions, fully framed; manufacturer's standard construction and hardware for swing operation.
1. Locking: Integrated padlock hasps for padlocks provided by KCDC.

D. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

E. Number Plates: Provide oval shaped aluminum plates. Form numbers ____ inch high of block font style with ADA designation, in contrasting color.

2.05 FASTENERS

A. Bolts, Nuts and Washers: Hot dip galvanized.

B. Anchorage Devices: Provide power driven, powder actuated, and drilled expansion bolts.

2.06 FINISHES

A. Painted Finish: Manufacturer's standard powder coat finish.
1. Color: Black.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.

C. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.

D. Bolt adjoining locker units together to provide rigid installation.

E. Install fittings if not factory installed.

F. Replace components that do not operate smoothly.

END OF SECTION

SECTION 10 55 00
Postal Specialties

PART 1 GENERAL

1.1 SECTION INCLUDES

A. 4C Horizontal Mailboxes
1.Front-loading interior (or exterior) mailboxes.

1.2 RELATED SECTIONS

A. Section 048000 - Masonry Assemblies.
B. Section 05400 - Cold Formed Metal Framing: Framed wall openings to receive mailboxes.
C. Section 055000 - Metal Fabrications: Metal anchors.
D. Section 06100 - Wood Framing: Framed wall openings to receive mailboxes.
E. Section 092500 - Gypsum Board.

1.3 REFERENCES

A. United States Postal Service (USPS)
1. USPS-STD-4C - United States Postal Service Standard 4C, Wall-Mounted Centralized Mail Receptacles
2. USPS Publication 16.
3. USPS Postal Bulletin – annual May issue listing approved 4C Manufacturers.
B. IBC - International Building Code.
C. ASTM A 666 - Specification for Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.
D. ASTM B 209 - Specification Aluminum and Aluminum Alloy Sheet and Plate.
E. ASTM B 221 - Specification Aluminum and Aluminum Alloy Extruded Bar, Rods, Wire, Shapes, and Tubes.

1.4 SUBMITTALS

A. Submit under provisions of Section 013000.
B. Provide manufacturer's standard catalog data for specified products. Manufacturer's data sheets on each product to be used, including:
1. Construction details, material descriptions, dimensions and finishes.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.
5. Care and cleaning instructions and recommendations.
C. Shop Drawings: Prepared specifically for this project; show dimensions of mail boxes, wall cuts, and interface with other products.

1.5 REGULATORY REQUIREMENTS

A. Comply with USPS-STD-4C for wall-mounted centralized mailboxes.
B. Comply with Americans with Disabilities Act Accessibility Guidelines (ADAAG).

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have a Quality System in place to ensure and be able to substantiate that manufactured units conform to requirements and match the approved design and must be ISO 9001:2008 certified.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inspect the materials upon delivery to assure that specified products have been received.
B. Store materials protected from exposure to harmful weather conditions.
C. Handle materials to prevent damage or marring of finish.

1.8 WARRANTY

A. Manufacturer's standard warranty to repair or replace components of postal specialties that fail in materials or workmanship within five years from date of purchase.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Florence Corporation, 5935 Corporate Drive, Manhattan, KS 66503; ASD. Tel: (785)323-4400, Tel: (800)275-1747. Fax: (800)275-5081. Email: sales@florencecorporation.com. Web: www.florencemailboxes.com.
B. Substitutions: Not permitted.

2.2 WALL-MOUNTED CENTRALIZED MAIL RECEPTACLES (MAILBOXES)

A. USPS Approved Front-Loading Mail Boxes: Horizontal style complying with USPS STD 4C and the following:
   1. Model: versatile™ 4C series by Florence Corporation.
      a) Module: Refer to the Drawings for module numbers.
   2. Mounting type:
      a. Recessed mounted into wall
      b. Surface mounted with manufacturer collar
      c. Pedestal-mounted with manufacturer pedestal (private delivery only).
   3. Locks: USPS-1172 910A, 3 keys each lock.
   4. Box Identification: Top to bottom, left to right.
      a. Numerical ID Tags
      b. Engraved identifier
      c. Engraved identifier with black fill.
      d. Numerical order.
      e. Alphabetical order.
   5. Mail Distribution:
      a. Mail Distribution: USPS.
      b. Mail Distribution: Private.
   6. Material and Finish: Aluminum with powder coat finish.
      a. Finish: Selected from manufacturer’s standard powder coat colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings in wall are correctly located, aligned, and sized for mailboxes.

B. Installer's Examination:

1. Examine conditions under which construction activities of this section are to be performed; submit written notification if such conditions are unacceptable.

2. Beginning installation indicates acceptance of conditions.

3.2 INSTALLATION

A. Install mail boxes in accordance with shop drawings and manufacturer's printed installation instructions.

B. Align, plumb, and level; anchor in accordance with manufacturer's requirements.

3.3 ADJUSTING

A. Adjust doors and locks to operate correctly.

3.4 CLEANING

A. Clean surfaces with mild dish detergent. Do not use harsh abrasive cleaners. Lubricate locks with graphite type lubricants only. Refer to manufacturer’s recommended methods.

3.5 PROTECTION OF INSTALLED PRODUCTS

A. Protect finishes from damage by construction activities. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10 56 17

WALL MOUNTED STANDARDS AND SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel shelf standards, brackets, and accessories.

B. Aluminum shelf standards, brackets, and accessories.

C. Closet rods for mounting on brackets.

D. Shelves.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking in walls for attachment of standards.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

C. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Brackets: Ten of each size of standard straight bracket.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products under cover and elevated above grade.

B. Store products in manufacturer's unopened packaging until ready for installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Shelf Standards and Brackets:
   1. Refer to drawing for Basis of Design.

B. Shelving:
   1. Wire Shelving and clothes rack/rod system
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

A. Steel Shelf Standards, Brackets, and Accessories:
   1. Heavy-Duty Shelf Standards and Brackets: Double-slotted channel standards for brackets adjustable in 1 inch increments along entire length of standard, drilled and countersunk for screws.
      a. Acceptable Product: KV 82/182.

b. Load Capacity: Recommended by manufacturer for loading of 300 to 450 pounds per pair of standards.
c. Lengths: As indicated on drawings.
d. Finish: Powder-coated.
e. Color: To be selected by Architect from manufacturer's full line.
f. Bracket Quantity: Provide one bracket for each 12 inches of standard length.

2. Closet Rods: Steel tubing for wall mounting in flange fittings.
   a. Type: Round chrome look, heavy duty; 1-1/16 inch outside diameter, 0.109 inch wall thickness.
   b. Length: As required for application, up to 12 feet.
   c. Provide mounting fittings to suit application.

B. Aluminum Shelf Standards, Brackets, and Accessories:
   1. Aluminum Components: ASTM B221 (ASTM B221M), alloy 6063, temper as indicated, with anodized finish complying with to AAMA 611, or powder coating complying with AAMA 2603 or AAMA 2604 for select colors.
   2. Pole Support Standards: Extruded aluminum pole supports with two or more channels designed to hold shelf support brackets inserted into channel ends or access slots and slid into desired position.
   3. Shelf Support Brackets:

C. Shelving:

D. Fasteners: Screws as recommended by manufacturer for intended application or as otherwise required by project conditions. Finish of exposed to view fasteners to match finish of standards and other components.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount standards to solid backing capable of supporting intended loads.

C. Install brackets, shelving, and accessories.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10 56 23
WIRE STORAGE SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted wire closet shelving.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking in walls for attachment of shelving.

B. Section 09 21 16 - Gypsum Board Assemblies: Blocking in metal stud walls for attachment of standards.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, with installation instructions.

C. Shop Drawings: Provide drawings prepared specifically for this project; show dimensions of shelving and attachment to substrates.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

C. Store flat to prevent warpage and bending.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wire Storage Shelving:
   1. ClosetMaid Corporation : www.closetmaid.com/#sle.
   2. RubberMaid Closet and Organization Products : www.rubbermaidcloset.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SHELVING APPLICATIONS

A. Shelf Depth: 12 inches (305 mm), unless otherwise indicated.

B. Master Bedroom Closets:
   1. Wall to wall shelf with free sliding hanger rod

C. Other Bedroom Closets:
   1. Wall-to-wall shelf with free sliding hanger rod.

D. Coat Closets:
   1. Wall-to-wall shelf with integral hanger rod.

E. Linen Closets:
   1. Wall-to-wall shelves spaced at 13 inch (330 mm) vertically, not less than 16 inch (408 mm) deep.

F. Storage Closets:
   1. Wall-to-wall storage shelves, close-mesh cross wire spacing, stacked at 13 inch (330 mm) vertically, not less than 12 inch (305 mm) deep.

2.03 MATERIALS

A. Wire Shelving: Factory-assembled coated wire mesh shelf assemblies for wall-mounting, with all components and connections required to produce a rigid structure that is free of buckling and warping.
   1. Construction: Cold-drawn steel wire with average tensile strength of 100,000 psi (690 MPa) resistance welded into uniform mesh units, square, rigid, flat, and free of dents or other distortions, with wires trimmed smooth.
   2. Coating: PVC or epoxy, applied after fabrication, covering all surfaces.
   3. PVC Coating: 9 to 11 mils (0.23 to 0.028 mm) thick.
   4. Epoxy Coating: Non-toxic epoxy-polyester powder coating baked-on finish, 3 to 5 mils (0.76 to 1.27 mm) thick.
   5. Standard Mesh Shelves: Cross deck wires spaced at 1 inch (25.4 mm).
   6. Close-Mesh Shelves: Cross deck wires spaced at 1/2 inch (12.7 mm).
   7. Shelf and Rod Units: Integral hanging rod at front edge of shelf.
   8. Free-Sliding Hanging Rod: Integral hanging rod that permits uninterrupted sliding of hangers the full width of the shelf.
   9. Corner Units: Same wire spacing as standard mesh shelves; provide wherever shelves meet at right angles.

B. Hanging Rod: Tubular steel, 1 inch (25 mm) diameter, with end caps on open ends.
   1. Finish: Epoxy powder coat.
   2. Wall Thickness: 20 gage, 0.035 inch (0.89 mm).
   3. Provide corner hanging rods and hanging rod connectors where required.

C. Wall-Mounted Standards: Vertically slotted channel standards with double-tab cantilever brackets to suit shelving; factory finished to match shelving.

D. Mounting Hardware: Provide manufacturer's standard mounting hardware; include support braces, wall brackets, back clips, end clips, poles, and other accessories as required for complete and secure installation; factory finished to match shelving.

E. Fasteners: As recommended by manufacturer for mounting substrates.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect areas to receive shelving, to verify that spaces are properly prepared to receive shelf units, and are of dimensions indicated on shop drawings.

B. Verify appropriate fastening hardware.

C. Do not begin installation until substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, with shelf surfaces level.

B. Cap exposed ends of cut wires.

C. Install back clips, end clips at side walls, and support braces at open ends. Install intermediate support braces as recommended by manufacturer.

D. Mounting Heights:
   1. Single Hanging Rod Units: Install shelf at 68 inches (1727 mm) above floor.
   2. Refer to drawings for mounting height in ADA units.

3.04 CLEANING

A. Clean soiled surfaces after installation.

3.05 PROTECTION

A. Protect installed work from damage.

B. Touch-up, repair, or replace damaged products before Substantial Completion in a manner that eliminates evidence of replacement.

END OF SECTION

SECTION 10 57 23
CLOSET AND UTILITY SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted wire closet shelving.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking in walls for attachment of shelving.

B. Section 09 21 16 - Gypsum Board Assemblies: Blocking in metal stud walls for attachment of standards.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Provide drawings prepared specifically for this project; show dimensions of shelving and attachment to substrates.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wire Storage Shelving:
   1. ClosetMaid Corporation : www.closetmaid.com
   2. RubberMaid Closet and Organization Products : www.rubbermaidcloset.com

2.02 SHELVING APPLICATIONS

A. Shelf Depth: 12 inches, unless otherwise indicated.

B. Bedroom Closets:
   1. Wall-to-wall shelf with hanger rod.
   2. Not less than 4 feet of shoe shelf.

C. Coat Closets:
   1. Wall-to-wall shelf with integral hanger rod.

D. Linen Closets:
   1. Wall-to-wall shelves spaced at 13 inch vertically, not less than 16 inch deep.

E. Storage Closets:
   1. Wall-to-wall storage shelves, close-mesh cross wire spacing, stacked at 13 inch vertically, not less than 12 inch deep.

2.03 MATERIALS

A. Wire Shelving: Factory-assembled coated wire mesh shelf assemblies for wall-mounting, with all components and connections required to produce a rigid structure that is free of buckling and warping.
   1. Construction: Cold-drawn steel wire with average tensile strength of 100,000 psi resistance welded into uniform mesh units, square, rigid, flat, and free of dents or other distortions, with wires trimmed smooth.
   2. Coating: PVC or epoxy, applied after fabrication, covering all surfaces.
   3. PVC Coating: 9 to 11 mils thick.
   4. Epoxy Coating: Non-toxic epoxy-polyester powder coating baked-on finish, 3 to 5 mils thick.
   5. Standard Mesh Shelves: Cross deck wires spaced at 1 inch.
   6. Close-Mesh Shelves: Cross deck wires spaced at 1/2 inch.
   7. Shelf and Rod Units: Integral hanging rod at front edge of shelf.

B. Hanging Rod: Tubular steel, 1 inch diameter, with end caps on open ends.
   1. Finish: Epoxy powder coat.

2. Provide corner hanging rods and hanging rod connectors where required.

C. Wall-Mounted Standards: Vertically slotted channel standards with double-tab cantilever brackets to suit shelving; factory finished to match shelving.

D. Mounting Hardware: Provide manufacturer's standard mounting hardware; include support braces, wall brackets, back clips, end clips, poles, and other accessories as required for complete and secure installation; factory finished to match shelving.

E. Fasteners: As recommended by manufacturer for mounting substrates.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect areas to receive shelving, to verify that spaces are properly prepared to receive shelf units, and are of dimensions indicated on shop drawings.

B. Verify appropriate fastening hardware.

C. Do not begin installation until substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, with shelf surfaces level.

B. Cap exposed ends of cut wires.

C. Install back clips, end clips at side walls, and support braces at open ends. Install intermediate support braces as recommended by manufacturer.

END OF SECTION

SECTION 10 82 00

GRILLES AND SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum grilles attached to structure.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Mounting substrates.

B. Section 04 20 00 - Unit Masonry: Mounting substrates.

C. Section 07 42 13 - Metal Wall Panels: Mounting substrates.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

E. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Submit detailed shop drawings, indicating component profiles, sections, finishes, fastening details, special details, and manufacturer's technical and descriptive data.
   1. Include field dimensions of openings and elevations on shop drawings.
   2. Indicate distinction between factory-assembled and field-assembled work on shop drawings.

C. Samples: Submit samples for color verification, 10 inches by 10 inches minimum.

D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in KCDC's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials indoors, protected from moisture, humidity, and extreme temperature fluctuations.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a one year period after Date of Substantial Completion.

C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum Grilles:
   1. Architectural Grilles & Sunshades, Inc; _____: www.agsshade.com/#sle.
   2. Construction Specialties, Inc; Geometric Grilles: www.c-sgroup.com/#sle.
   3. DAMS Incorporated; TU Series: www.damsinc.com/#sle.
   4. Industrial Louvers, Inc; _____: www.industriallouvers.com/#sle.
   5. Metalwerks; Screenwalls: www.metalwerksusa.com/#sle.
   6. Ruskin Company; _____: www.ruskin.com/#sle.
   7. _____.
   8. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ALUMINUM GRILLES

A. Aluminum Grilles: Provide shop fabricated, shop finished grilles assembled into panels.
   1. Panel Size and Configuration: As indicated on drawings.
   2. Frame/Support: Extruded aluminum tube or flat aluminum bar.

2.03 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M) alloy 6063, temper T5, 1/8 inch minimum wall thickness.

B. Concealed Structural Supports: Aluminum, or steel coated for corrosion resistance and dissimilar metal isolation.

2.04 FABRICATION

A. Shop fabricate grilles to the greatest extent possible.

B. Disassemble as neccessary for shipping and handling, clearly mark units for proper reassembly.

C. Provide supports, anchorages, and accessories as required for complete assembled system.

2.05 FINISHES

A. Finish Color: As selected by Architect from manufacturer's standard color range.

2.06 ACCESSORIES

A. Fasteners: ASTM F593 stainless steel or ASTM A307 carbon steel, sizes to suit installation conditions.

B. Anchors and Inserts: Corrosion resistant; type, size, and material required for loading and installation as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that painting, roofing, masonry work, and other adjacent work that might damage grille finish has been completed prior to start of installation.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written installation instructions.

B. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint, and allow paint to dry prior to installation of aluminum components.

C. Set grilles level, plumb, with uniform joints, and in alignment with adjacent work as indicated.

D. Mechanically secure grilles to supporting structure.

E. Do not cut or trim aluminum members without approval of manufacturer; do not install damaged members.

3.03 CLEANING

A. Remove temporary protective covering as grilles are installed.

B. Clean finished surfaces as recommended by manufacturer and maintain clean condition until Date of Substantial Completion.

C. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

D. Replace grilles that have been damaged beyond touch-up repair.

3.04 PROTECTION

A. Provide protection of installed grilles to ensure grilles are without damage until Date of Substantial Completion.

END OF SECTION

SECTION 11 30 13
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

B. Laundry appliances.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Plumbing connections for appliances.

B. Section 26 05 83 - Wiring Connections: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Kitchen Appliances are Owner Furnished and Contractor Installed

B. Refer to plans for locations of kitchen equipment to be installed by contractor.

C. Washer / Dryer are NIC and to be provided and installed by tenant.

2.02 LAUNDRY APPLIANCES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 12 21 13
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the placement of concealed blocking to support blinds. See Section 06 10 00.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.

C. Maintenance Materials: Furnish the following for KCDC's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Blind Assemblies: One of each size.
   3. Extra Slats: 20 of each type and size.
   4. Extra Lift Cords, Control Cords, and Wands: Two of each type.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Horizontal Louver Blinds: (TYPE WC-1 & WC-2) composite & faux wood
   1. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com
   2. Budget Blinds: www.budgetblinds.com
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FABRICATION

A. Determine sizes by field measurement.

B. Fabricate blinds to fit within openings with uniform edge clearance as recommended by manufacturer

C. Fabricate blinds to cover window opening

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive the work.

B. Ensure structural blocking and supports are correctly placed. See Section 06 10 00.

3.02 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with flush countersunk fasteners.

3.03 TOLERANCES

A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.

B. Maximum Offset From Level: 1/8 inch.

3.04 ADJUSTING

A. Adjust blinds for smooth operation.

3.05 CLEANING

A. Clean blind surfaces just prior to occupancy.

B. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

END OF SECTION

SECTION 12 24 00
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
   2. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Selection Samples: Include fabric samples in full range of available colors and patterns.

E. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in KCDC's name and registered with manufacturer.

H. Maintenance contracts.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: One year.
   2. Fabric: One year.
   3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com
   2. MechoShade Systems LLC; Mecho/5 System: www.mechoshade.com
   3. SWFcontract, a division of Springs Window Fashions, LLC.; www.swfcontract.com

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades Type WC-3:
   1. Basis of Design: SWF Contract.
   2. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
      a. Drop Position: Regular roll.
      b. Roll Direction: Roll down, closed position is at window sill.
      c. Mounting: Window jamb mounted- inside, between jambs.
      d. Fabric: as indicated on drawings
   3. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   4. Roller Tubes: As required for type of shade operation.
   5. Hembars: Designed to maintain bottom of shade straight and flat.
   6. Manual Operation for Interior Shades:
      a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
      b. Drive Chain: Continuous loop beaded ball chain, 95 pounds minimum breaking strength. Provide upper and lower limit stops.

2.03 SHADE FABRIC

A. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Manufacturers:
      a. SWF Contract; Double-Take.
   2. Material: Vinyl coated polyester.
   3. Openness Factor: 3%.
   4. Color: Grey / Bronze.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to KCDC.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for manufactured casework.

B. Wall-hung counters and vanity tops.

C. Sinks molded into countertops.

1.02 RELATED REQUIREMENTS

A. Section 06 41 00 - Architectural Wood Casework.

B. Section 09 30 00 - Tiling: Tile for countertops.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2018).

D. IAPMO Z124 - Plastic Plumbing Fixtures; 2017.

E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

F. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.

G. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.

H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

I. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Installation Instructions: Manufacturer's installation instructions and recommendations.

H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

B. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.

2. Provide designated labels on shop drawings as required by certification program.
3. Provide designated labels on installed products as required by certification program.
4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Manufacturers:
         1) Formica Corporation: www.formica.com
         2) Wilsonart: www.wilsonart.com
      b. Finish: as indicated on drawings
      c. Surface Color and Pattern: As indicated on drawings.
   2. Exposed Edge Treatment: Post formed laminate; front edge substrate built up to minimum 1-1/4 inch thick with raised radiused edge, integral coved backsplash with radiused top edge.
   3. Exposed Edge Treatment: Molded rubber edge with T-spline, sized to completely cover edge of panel.
   4. Back and End Splashes: Same material, same construction.

C. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Avonite Surfaces: www.avonitesurfaces.com
         2) Formica Corporation: www.formica.com
         3) Wilsonart: www.wilsonart.com
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. Sinks and Bowls: Integral castings; minimum 3/4 inch wall thickness; comply with IAPMO Z124.
      d. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
   3. Other Components Thickness: 1/2 inch, minimum.
   4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

D. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
   1. Flat Sheet Thickness: 1-1/4 inch, minimum.

2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
   a. Manufacturers:
      1) Cambria Company LLC: www.cambriausa.com
   b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA Dimension Stone Design Manual.
   c. Finish on Exposed Surfaces: Polished.
3. Other Components Thickness: 3/4 inch, minimum.
4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes. Provide grommet where required

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
   1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions, and as detailed on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. Install tile as specified in Section 09 30 00.

D. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 93 13
BICYCLE RACKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Indoor bicycle racks.

B. Indoor bicycle accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Mounting surface for bicycle racks.

1.03 REFERENCE STANDARDS

A. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Indicate size, shape, and dimensions, including clearances from adjacent walls, doors, and obstructions.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Handle racks and accessories with sufficient care to prevent scratches and other damage to the finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Indoor Bicycle Racks:
   1. Bike Security Racks Company, Inc; _____: www.bikeracks.com/#sle.
   2. CycleSafe, Inc: www.cyclesafe.com/#sle.
   3. Highland Products Group, LLC; _____: www.theparkcatalog.com/#sle.
   4. Saris Infrastructure; Vertical Bike Rack: www.sarisinfrastructure.com/#sle.
   5. Wirecrafters; www.wirecraft.com/products/bicycle-storage
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 BICYCLE RACKS AND ACCESSORIES

A. Indoor Bicycle Racks: Device designed for indoor storage of bicycles; allows user-provided lock to simultaneously secure one wheel and part of the frame on each bicycle parked or racked.
   1. Capacity: per drawings bicycles.
   2. Finish: Powder coat, maintenance-free and weather-resistant.
   3. Color: As selected by Architect from manufacturer's standard range.

B. Materials:

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive bicycle racks and accessories..

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Do not begin installation until unsatisfactory substrates have been properly repaired.

D. Confirm that the required facility services have been provided and correctly installed before proceeding with installation of accessories.

3.02 PREPARATION

A. Ensure surfaces to receive bicycle racks and accessories are clean, flat, and level.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install bicycle racks and accessories level, plumb, square, and correctly located as indicated on drawings.

C. Coordinate installation of accessories with plumbing and electrical work by other trades.

D. Post-Installed Anchors: Comply with ICC-ES AC308.

E. Freestanding installation: Place in location indicated on drawings.

3.04 CLEANING

A. Clean installed work to like-new condition. Do not use cleaning materials or methods that could damage finish.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 14 21 00
ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies electric traction elevators.

B. Work Required:

1. The work required under this section consists of all labor, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator(s) as herein specified.

2. All work shall be performed in a first class, safe and workmanlike manner.

3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make complete installation.

C. Related work not specified herein: The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer.

1. Construction Facilities and Temporary Controls: protection of floor openings and personnel barriers; temporary power and lighting.
2. Earthwork: excavation for elevator pit.
3. Cast-In-Place Concrete: elevator pit, and elevator machine foundation.
4. Unit Masonry: masonry hoistway enclosure, building-in and grouting hoistway doorframes, and grouting of sills.
5. Metal Fabrications: pit ladder, divider beams, and supports for entrances, rails and hoisting beam at top of elevator machine room.
6. Cementitious Waterproofing: waterproofing of elevator pit.
7. Heating, Ventilating, and Air Conditioning: ventilation and temperature control of elevator equipment areas.
8. Electrical:
   a. Main disconnects for each elevator.
   b. Electrical power for elevator installation and testing.
   c. Disconnecting device to elevator equipment prior to activation of sprinkler system.
   d. The installation of dedicated GFCI receptacles in the pit and overhead (with Machine room-less).
   e. Lighting in controller area, machine area and pit.
   f. Wiring for telephone service to controller.
9. Emergency (Standby) Power Supply Systems: emergency generator for elevator operation.
10. Fire Alarm Systems: The installation of fire and smoke detectors at required locations and interconnecting devices; fire alarm signal lines to contacts in the machine room.
11. Telephone Systems: ADAAG-required emergency communications equipment.

D. Applicable Codes: Comply with applicable building codes and elevator codes at the project site, including but not limited to the following:

1. ANSI A117.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
2. ADAAG, Americans with Disabilities Act Accessibility Guidelines.
3. ANSI/NFPA 70, National Electrical Code.

4. ANSI/NFPA 80, Fire Doors and Windows.
5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.
6. ANSI/UL 10B, Fire Tests of Door Assemblies.
7. CAN/CSA C22.1, Canadian Electrical Code.
8. CAN/CSA-B44, Safety Code for Elevators and Escalators.
9. EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity"
10. Model & Local Building Codes.
11. All other local applicable codes.

[NOTE: EDIT ITEMS SHOWN IN [BOLD] TEXT]

1.02 SYSTEM DESCRIPTION

A. Equipment Description: Freedom MRL-MB Series; Gearless; Imperial-525

B. Control: Motion 4000 / ELGO; Duplex Controller Operation.

C. Quantity of Elevators: 2

D. Elevator Floor Labels:

E. Stops (maximum): 5

F. Openings (front): 5

G. Openings (rear): 0

H. Travel: Refer to Drawings

I. Rated Capacity: 3500 lbs.

J. Speed: 350 fpm

K. Entrance Type and Width: Two Speed Slide Door / 54""

L. Entrance Height: 8' - 0"

M. Main Power Supply: 208 Volts + or - 5% of normal, three-Phase, with a separate equipment grounding conductor.

N. Car Lighting Power Supply: 120 Volts, Single-phase, 15 Amp, 60 Hz.

O. Machine Location: Inside machine room located above hoistway.

P. Signal Fixtures: Standard Freedom® fixtures

Q. Control Location: Controller(s) shall be located above the hoistway in a machine room.

R. Performance:

1. Car Speed: $\pm$ 3 % of contract speed under any loading condition or direction of travel.
2. Car Capacity: Safely lower, stop and hold up to 125% of rated load.
3. Acceleration: 3 – 3.2 ft/sec^2
4. Jerk rates: 6 – 8 ft./ sec^3

S. Ride Quality:

1. Vertical Vibration (maximum): 12 – 17 milli-g
2. Horizontal Vibration (maximum): 10 – 15 milli-g
3. Vertical Jerk (maximum): 8 ft./ sec^3

4. Acceleration/Deceleration: 3.0 – 3.2 ft./ sec^2
5. In Car Noise: 50 – 55 dB(A)
6. Stopping Accuracy: ± 0.125 in.
7. Re-leveling Distance: ± 0.4 in.

T. Operation:

Duplex Collective Operation: Using a microprocessor-based controller, the operation shall be automatic by means of the car and hall buttons. In the absence of system activity, one car can be made to park at the pre-selected main landing. The other (free) car shall remain at the last landing served. Only one car shall respond to a hall call. If either car is removed from service, the other car shall immediately answer all hall calls, as well as its own car calls.

U. Operating Features – Standard

1. Full Collective Operation
2. Anti-nuisance
3. Fan and Light Protection
4. Load Weighing Bypass
5. Independent Service
6. Full Collective Operation
7. Firefighters' Service Phase I and Phase II**; or** Special Emergency Service Phase I and II – Emergency Recall
8. Top of Car Inspection
9. Hoistway access
10. Zoned Car Parking

V. Door Control Features:

1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.

2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.

   Primary door protection shall consist of a two-dimensional, multi-beam array projecting across the car door opening. Under normal operation and for any door position, the system shall detect as a blockage an opaque object that is equal to or greater than 1.3 inches (33 mm) in diameter when inserted between the car doors at vertical positions from within 1 inch (25 mm) above the sill to 71 inches (1800 mm) above the sill. Under degraded conditions (one or more blocked or failed beams), the primary protection shall detect opaque objects that are equal to or greater than 4” (100 mm) in diameter for the same vertical coverage. If the system performance is degraded to the point that the 4” object cannot be detected, the system shall maintain the doors open or permit closing only under nudging force conditions.

   The door reopening device shall also include a secondary, three-dimensional, triangular infrared multi-beam array projecting across the door opening and extending into the hoistway door zone. The door opening device will cause the doors to reopen when it detects a person(s) or object(s) entering or exiting the car in the area between the hoistway doors or the entryway area adjacent to the hoistway doors.

   The size of the secondary protection zone shall vary as the door positions vary during

opening and closing. The width of the zone shall be approximately one-third the size of the separation between the doors (or door and strike plate for single-slide doors) and shall be approximately centered in the door separation. In order to minimize detection of hallway passers-by who are not entering the elevator, the maximum zone penetration into the entryway shall not exceed 20” for any door separation. Normal penetration depth into the entryway from the car doors shall be ~14” for a door separation of 42”. The penetration shall reduce proportionally as the doors close. At door separations of 18” or less the secondary protection system may cease its normal operation since the depth of the zone recedes to where it is inside the hoistway doors. The vertical coverage of the secondary protection shall be ~19” (480 mm) above the sill to ~55” (1400 mm) above the sill (mid-thigh to shoulder of a typical adult).

The secondary protection shall have an anti-nuisance feature that will ignore detection in the secondary zone after continual detection occurs for a significant time period in the secondary zone without corresponding detection in the primary protection zone; i.e. a person/object is in the entryway but does not enter. Normal secondary protection shall be re-enabled whenever detection occurs in the primary zone.

The reaction time of the door detector sub-system shall not exceed 60 milliseconds when both primary and secondary protection capabilities are active; nor 40 milliseconds when the secondary protection is disabled.

3. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

W. Provide equipment according to seismic zone: 3

1.03 SUBMITTALS

A. Product Data: Submit manufacturer’s product data for each system proposed for use. Include the following:

1. Car and hoistway fixtures including button selections, Braille selections, indicator selections and metal finish selections
2. Cab interior design, interior dimensions, ceiling details and wall panel selection charts for cab and entrance finishes
3. Dimensional entrance details
4. Electrical characteristics and connection requirements
5. Individual heat release values for the elevator control, hoist machines, transformers (if applicable) and line reactors (if applicable) expressed as (BTU)
6. Compliance with NEMA frame dimensions for the hoist machine

B. Shop Drawings: Submit drawings including material selection and dimension outlining:

1. Cab, counterweight, guide rail locations, buffers and other components in hoistway
2. Designed rail bracket spacing
3. Maximum loads and reaction locations where loads are imposed onto car guide rails, counterweight guide rails or machine beams requiring load transfer to building structure
4. Car and counterweight travel and clearances
5. Clear inside hoistway, pit and overhead dimensions
6. Location and sizes of access doors, hoistway entrances and frames
7. Electrical requirements

C. Heat release values expressed in BTU/HR/Car

D. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual, pre-inspection and inspection manuals, control manual and motor drive manual

1.04 QUALITY ASSURANCE

A. Manufacturer: Elevators shall be designed to allow any qualified elevator service provider to provide full service contracts without exception. Non-proprietary controls, hoist machines, fixtures and door equipment shall be utilized. Hoist machines shall meet NEMA frame dimensions. Sole sourced OEM hoist machines shall not be provided. Suspension means shall be time tested industry standard wire rope. Variances for non-standard elevator materials will not be accepted.

B. Installer: Elevators shall be designed using only time tested industry standard material and shall be capable of being purchase, installed, serviced and repaired by any qualified elevator company without exception.

C. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permits as required by the elevator inspection authority, and make such tests as are called for by the regulations or such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

1.05 DELIVERY, STORAGE AND HANDLING

A. Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises at no cost to the elevator contractor.

Should the storage area be off-site and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area. The cost of elevator equipment taken to storage by either party, storage, and redeliver to the job site shall not be at the expense of the elevator contractor.

1.06 WARRANTY

A. The elevator contractor’s acceptance is conditional on the understanding that their warranty covers defective material covered by the elevator manufacturer and workmanship. The guarantee period shall not be less than 15 months from the date of completion or acceptance thereof by beneficial use, whichever is earlier, of each elevator. The warranty excludes: ordinary wear and tear or improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose. The manufactures standard warranty shall be submitted as part of a qualified bid.

1.07 MAINTENANCE and SERVICE

A. Maintenance service consisting of regular examinations and adjustments of the elevator equipment shall be provided by the elevator contractor for a period of 12 months after the elevator has been turned over for the customer’s use. All work shall be performed by competent employees during regular working hours of regular working days and shall include emergency 24-hour callback service. This service shall not cover adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the

original equipment shall be provided.

B. Periodic inspection and lubrication of elevator components shall be required as indicated in the operation and maintenance manual.

C. The elevator inclusive of the control, fixtures and the door control must:

1. Allow any elevator contractor to install, adjust and provide full service maintenance agreements without exception

2. Be designed to allow any elevator contractor the ability to obtain all control replacement materials included but not limited to board replacements, drive replacements, processors, etc. at a published price. Qualified bids shall be submitted with a complete cataloged parts list including published replacement prices available to the service provider selected by the building owner.

3. Include phone technical support available for the service provider selected by the building owner.

4. Be provided with an unconditional adjustment manual, unconditional troubleshooting manual and straightline wiring diagrams outlining all internal terminal to terminal connections and electrical values within the control as well as connections to all peripheral items connected to the control system. Final “As Built” duplicates shall be available in the future for a published price at the request of any elevator contractor, building owner or elevator consultant.

5. Shall not require monitoring of the non-standard belt suspension means

6. Provide in the controller the necessary devices to run the elevator in inspection operation.

7. Provide top of car control necessary to run the elevator on inspection operation

8. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.

9. Provide the means from the controller to reset elevator earthquake operation

PART 2 - PRODUCTS

2.01 DESIGN AND SPECIFICATIONS

A. Provide: Machine room Freedom® traction passenger elevators from Canton Elevator Company. The control system and car design based on materials and systems manufactured by Canton Elevator Company. Specifically, the system shall consist of the following components:

1. An AC gearless machine using embedded permanent magnets mounted machine room in machine room above the hoistway.

B. Approved Installer: Any owner / AHJ qualified elevator contractor

C. Maintenance Provider: Any owner / AHJ qualified elevator contractor

2.02 EQUIPMENT: CONTROL ROOM COMPONENTS

A. Controller: A microcomputer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.

1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected

from accidental contact in a situation where the controller doors are open.
2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
3. Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): “EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity”

B. Drive: A Variable Voltage Variable Frequency AC regenerative drive system shall be provided. The drive shall be set up for regeneration of AC power back to the building grid.

2.03 EQUIPMENT: MACHINE AND GOVERNOR

A. Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency drum or disc brakes, mounted in the machine room above the hoistway.

B. Governor: The governor shall be a centrifugal jaw type with pit tension device.

C. Buffers, Car and Counterweight: Oil type buffers shall be used.

D. Hoistway Operating Devices:
1. Emergency stop switch in the pit
2. Terminal stopping switches.

E. Positioning System: Consists of an encoder, reader box, and door zone vanes.

F. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.

G. Suspension: Traditional traction steel wire rope available from multiple sources.

H. Governor Rope: Governor rope shall be traction steel and shall consist of at least eight strands wound about a sisal core center.

I. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.

J. Hoistway Entrances:

1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.

2. Sills shall be extruded: Aluminum.

3. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.

4. Fire Rating: Entrance and doors shall have a UL 1-1/2 hour fire protection rating.

5. Entrance Finish: #4 Satin Stainless Steel.

6. Entrance marking plates: Entrance jambs shall be marked with 4” x 4” (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.

7. Sight Guards: Black sight guards will be furnished.

L. Counterweight Safeties: Where “Occupied Space” exists under the elevator hoistway, counterweight safeties shall be applied to the underside of the counterweight frame, and shall be either a type “A” or “B” depending on the rated speed.

2.04 EQUIPMENT: CAR COMPONENTS

A. Carframe and Safety: A carframe fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the carframe and shall be Type "B", flexible guide clamp type.

B. Cab: # 4 brushed stainless steel shell with removable vertical plastic laminate selected from standard catalog of choices.

C. Car Front Finish: #4 satin stainless steel.

D. Car Door Finish: #4 satin stainless steel.

E. Car Top: 12 gauge # 4 stainless steel.

F. Ceiling Type:

Polygal suspended ceiling shall consist of white translucent polycarbonate diffusers set in frame of extruded # 4 stainless steel with fluorescent lighting fixtures.

G. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car and provide current to the alarm bell in the event of building power failure.

H. Emergency Pulsating Siren: Siren mounted on top of the car that is activated when the Alarm button in the car operating panel is engaged. Siren shall have a rated sound pressure level of 80 dB(A) at a distance of 3.0 m from the device. Siren shall respond with a delay of not more than 1 second after the switch or push button has been pressed.

I. Fan: A two-speed 120 VAC fan will be mounted to the structural ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. This two-speed fan produces airflow rates of 7.2 and 9.2 m^3/min on low and high setting respectively. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.

J. Handrail: Handrails shall be provided on the rear wall of the car enclosure. Handrails shall be 1-1/2” round tubular handrail with a #4 satin stainless steel finish.

K. Threshold: Aluminum.

L. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

M. Roller Guides: Rubber roller guides shall be mounted on the top and the bottom of the car and counterweight. Car roller guides shall be a minimum of 3 rollers, 6” in diameter and the counterweight roller guides shall be 3 rollers, 6” in diameter.

N. Platform: The car platform shall be constructed of 2 layers of plywood.

O. Certificate frame: Provide a Certificate frame with a # 4 satin stainless steel finish.

2.05 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: A car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a #4 satin stainless steel finish.

1. Applied car operating panel shall be furnished. It shall contain a bank of round metal mechanical illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served, an emergency call button, door open and door close buttons, and switches for lights, inspection and the exhaust fan. The emergency call button shall be connected to a bell that serves as an emergency signal. All buttons to have raised numerals and Braille markings. # 4 Stainless Steel finish.

The car operating panel shall be equipped with the following features:

Standard:
1) Raised markings and Braille shall be provided to the left hand side of each push-button.
2) Car Position Indicator at the top of and integral to the car operating panel.
3) Door open and door close buttons.
4) Light key-switch.
5) Fan key-switch.
6) Inspection key-switch.
7) Elevator Data Plate marked with elevator capacity and car number.
8) Illuminated alarm button with raised markings.
10) In car stop switch (toggle or key unless local code prohibits use)
11) Firefighter’s hat (standard USA)
12) Firefighter’s Phase II Key-switch (standard USA)
13) Call Cancel Button (standard USA)

B. Car Position Indicator: A 16-segment, digital, vacuum fluorescent car position indicator shall be integral to the car operating panel.

Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Hall fixtures shall have round mechanical buttons in flush mount face frame. Buttons shall be 1/8” projecting in vertically mounted fixture. Hall lanterns and position indicators shall be illuminated by means of LED. Fixture shall be #4 satin stainless steel finish.

C. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.

D. Access key-switch at top floor in entrance jamb.
E. Access key-switch at lowest floor in entrance jamb.

PART 3 - EXECUTION

3.01 PREPARATION

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Installation of all elevator components except as specifically provided for elsewhere by others.

3.03 DEMONSTRATION

A. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner's representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.

END OF SECTION

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. All areas indicated on plans shall be provided with an automatic sprinkler system in accordance with N.F.P.A. 13.

B. It shall be the Contractors responsibility to examine all architectural drawings, sections, details and structural drawings to determine areas required to be sprinklered to meet applicable code requirements.

C. All cutting of holes necessary for the installation of work specified under this section of the specifications shall be done by this Contractor. Applicable provisions elsewhere in the specifications apply here, also. Cutting will be done under the supervision of the General Contractor. Do all patching of concrete, masonry and other materials which are cut by this Contractor, employing the services of the Contractor whose work is cut. Patching shall be of the same material and shall be finished neatly.

D. A complete combination sprinkler and standpipe system shall be furnished and installed to insure the lowest insurance rate possible; however, no requirements of NFPA 13, NFPA 14, Local Fire Marshall, State Fire Marshall, Division of Fire Prevention and Water Department, shall be violated and/or omitted.

1.02 DRAWINGS

A. The drawings show and the specifications describe the work intended under this section, but the Contractor shall be solely responsible for taking his own measurements and installing the work to fit the conditions encountered. Everything necessary for a complete and satisfactory installation shall be furnished and installed by this Contractor performing work under this contract, whether or not specifically shown or specified. This is not intended to cover major items of equipment not shown or specified but is intended and will be interpreted to cover all miscellaneous parts, devices, accessories, controls, and appurtenances which are required by any applicable code, ordinance, regulation or law required to complete and place the system in satisfactory operation and required for a first class job which is complete in every respect.

B. The sprinkler-standpipe system drawings are generally diagrammatic and are intended to show the location of areas to be sprinklered. It shall be the responsibility of this Contractor to perform complete hydraulic calculation and install all sprinkler work to coordinate with other trades in advance so as to clear all interferences with all architectural, structural, electrical, heating, ventilating, air conditioning, plumbing, sewerage, and other work. Any work installed by this Contractor which interferes with any other work by failure to coordinate said work shall be altered by this Contractor at his own expense as directed by the Designer to clear such interferences.

1.03 DEVIATIONS

A. No deviations from the plans and specifications shall be made without the full knowledge and consent of the Designer. Should this Contractor find at any time during the progress of the work that, in his judgment, existing conditions made desirable a modification in requirements covering any item he shall report such items to the Designer for his decision and instructions. No changes shall be made until written request has been made by the Contractor to the Designer and written approval of said change has been given by the Designer.

1.04 OMISSIONS

A. The drawings and specifications shall both be considered as part of the contract. Any work or material shown in one and omitted in the other shall be furnished and performed as though shown in both to give a complete sprinkler job approvable by the State Fire Marshall. The awarding of the contract shall be construed to mean that this Contractor will install a complete and satisfactory system, furnishing all items of materials and labor to accomplish this result whether or not such items are particularly specified or shown on plans. Should any

discrepancy or omission be discovered in the plans or specifications, such must be reported to the Designer immediately in order that any necessary addenda may be issued before the bids are received.

1.05 PERMITS, LICENSES AND INSURANCE

A. The Contractor shall obtain and pay for all permits, licenses, fees, etc., required for his work.

1.06 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional costs. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.07 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire-suppression installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

1.08 SHOP DRAWINGS

A. Submit shop drawings to Designer. Obtain stamped approved plans and letter of approval and then submit approved drawings and letters to Authorities Having Jurisdiction for approval. No sprinkler or standpipe work shall be done prior to all above approvals.

B. Submittal data and drawings shall be examined by the General Contractor prior to his transmitting to the above-mentioned authorities. The submittals shall bear the Contractor's stamp of approval evidencing that he has examined and checked same and that he found the information contained to be in accordance with the Contract requirements.

C. All materials and equipment furnished under this Division 21 shall be new and approved by Underwriters' Laboratories, Inc. (UL), Factory Mutual (FM), or American Water Works Association (AWWA) where applicable.

1.09 GUARANTEE

A. The Contractor shall furnish a guarantee covering all labor and materials for a period of one year from date of acceptance of his work which shall include an agreement to repair replace and make good at his expense, any and all defects which may appear in his work or materials during that time, which in the judgment of the Designer arise from defective workmanship or imperfect or inferior materials.

PART 2 - PRODUCTS

2.01 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

C. Glue Joints:
   1. Solvent cements for joining CPVC plastic piping: ASTM F493

2.02 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
   1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   2. Pressure Plates: Plastic. Include two for each sealing element.

3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.03 SLEEVES

A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

B. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
   1. Underdeck Clamp: Clamping ring with set screws.

2.04 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type:
   1. Finish: Polished chrome-plated.

D. One-Piece, Floor-Plate Type: Cast-iron floor plate.

2.05 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psi 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
   1. New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      c. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.

d. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
e. Bare Piping in Equipment Rooms: One-piece, cast-brass type.

K. Permanent sleeves are not required for holes formed by removable PE sleeves.

L. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
1. Cut sleeves to length for mounting flush with both surfaces.
a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe. Use the following sleeve materials:
a. Steel Pipe Sleeves: For pipes smaller than NPS 6
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
1) Seal space outside of sleeve fittings with grout.
4. Except for underground wall penetrations, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to details on drawings for U.L. system numbers and penetration firestops.

Q. Verify final equipment locations for roughing-in.

3.02 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

F. Plastic Piping Solvent - Cement Joints:
   1. Clean and dry joining surfaces. Joint pipe and fittings according to the following:
      a. Comply with ASTM F402 for safe-handling practice of cleaners, primers and solvent cements.
      b. CPVC piping: Join according to ASTM 02846/D2846M Appendix.

3.03 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

B. Field Welding: Comply with AWS D1.1.

END OF SECTION

SECTION 21 10 00

FIRE-SUPPRESSION SYSTEMS

(BUILDING #1)

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTIONS

A. Combined Standpipe and Sprinkler System: Fire-suppression system with both standpipe and sprinkler systems. Sprinkler system is supplied from standpipe system.

B. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

C. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device.

D. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from sprinklers that are open.

1.02 PERFORMANCE REQUIREMENTS

A. Standard Piping System Component Working Pressure: Listed for at least 175 psig

B. Fire-suppression standpipe system design shall be approved by authorities having jurisdiction.

C. Fire-suppression sprinkler system design shall be approved by authorities having jurisdiction.
   1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
   2. Sprinkler Occupancy Hazard Classifications:
      a. Building Service Areas: Ordinary Hazard, Group 1.
      b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
      c. General Storage Areas: Ordinary Hazard, Group 1.
      d. Laundries: Ordinary Hazard, Group 1.
      e. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
      f. Office and Public Areas: Light Hazard.
      g. Residential Living Areas: Light Hazard.
   3. Minimum Density for Automatic-Sprinkler Piping Design:
      a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
      b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
   4. Maximum Protection Area per Sprinkler: Per UL listing.
   5. Maximum Protection Area per Sprinkler:
      a. Public Spaces, Corridors, Dorm Rooms: 225 sq. ft
      b. Storage Areas: 130 sq. ft. Mechanical Equipment Rooms: 130 sq. ft
      c. Electrical Equipment Rooms: 130 sq. ft
      d. Other Areas: According to NFPA 13 recommendations, unless otherwise indicated.
   6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13, unless otherwise indicated:
      a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
      b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

D. Seismic Performance: Fire-suppression piping shall be capable of withstanding the effects of earthquake motions determined according to NFPA 13 and ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1.03 ELEVATOR SPRINKLER SYSTEM

A. All sprinkler heads shall be installed in bottom of elevator shaft and in elevator equipment room.

B. Heads shall be sidewall type in shaft and brass upright or sidewall type as required for elevator equipment room.

C. Heads shall be 212° type.

D. A gate valve with tamper switch shall be installed on all lines serving elevator shafts and elevator machine rooms.

E. Installation shall be in accordance with elevator inspector.

1.04 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test performed by sprinkler subcontractor.

B. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:
   1. NFPA 13, "Installation of Sprinkler Systems."
   2. NFPA 14, "Installation of Standpipe, Private Hydrant, and Hose Systems."
   3. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."
   4. NFPA 20, “Installation of Fire Pumps.”

1.05 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.06 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Sprinkler Cabinets: Finished, wall-mounting, steel cabinet with hinged cover, with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project.

PART 2 - PRODUCTS

2.01 STEEL PIPE AND FITTINGS

A. Threaded-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, with factory- or field-formed threaded ends.
   1. Ductile Iron Threaded Flanges: ASME B16.1.
   2. Malleable-Iron Threaded Fittings: ASME B16.3.
   3. Gray-Iron Threaded Fittings: ASME B16.4.
   4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.
   5. Steel Threaded Couplings: ASTM A 865.

B. Threadable, Thinwall Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness less than Schedule 40 and greater than Schedule 10.
   1. Ductile Iron Threaded Fittings.
   2. Ductile-Iron Threadable Fittings.

C. Standard Weight, Galvanized-Steel Pipe: ATSM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

2.02 CPVC PIPE AND FITTINGS

A. CPVC Pipe: ASTM F 442/F 442M and UL 1821, SDR 13.5, for 175-psig (1200-kPa) rated pressure at 150 deg F (62 deg C), with plain ends. Include “Listed” and “CPVC Sprinkler Pipe” markings.
   1. CPVC Fittings: UL-listed, for 175-psig (1200-kPa) rated pressure at 150 deg F (62 deg C), socket type. Include “Listed” and “CPVC Sprinkler Fitting: markings.
      a. NPS ¾ to NPS 1-1/2 (DN 20 to DN 40): ASTM F 438 and UL 1821, Schedule 40.
      b. NPS 2 to NPS 3 (DN 50 to DN 80): ASTM F 439 and UL 1821, Schedule 80.

c. Fittings to be same manufacturer as piping being utilized.

2.03 DIELECTRIC FITTINGS

A. Assembly shall be copper alloy, ferrous, and insulating materials with ends matching piping system.

B. Dielectric Unions: Factory-fabricated assembly, designed for 250-psig minimum working pressure at 180 deg F Include insulating material that isolates dissimilar materials and ends with inside threads according to ASME B1.20.1.

C. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 175-psig minimum working-pressure rating as required for piping system.

D. Dielectric Flange Insulation Kits: Components for field assembly shall include CR or phenolic gasket, PE or phenolic bolt sleeves, phenolic washers, and steel backing washers.

E. Dielectric Couplings: Galvanized steel with inert and noncorrosive thermoplastic lining and threaded ends and 300-psig working-pressure rating at 225 deg F

F. Dielectric Nipples: Electroplated steel with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved ends and 300-psig working-pressure rating at 225 deg F.

2.04 SPRINKLER SPECIALTY FITTINGS

A. One Piece Sprinkler Drain and Test Fittings: Cast- or ductile-iron body; with threaded inlet and outlet, test valve, integral sight glass.

B. Sprinkler Inspector's Test Fitting: Cast- or ductile-iron housing with threaded inlet and drain outlet and sight glass.

2.05 LISTED FIRE-PROTECTION VALVES

A. Valves shall be UL listed, with 175-psig minimum pressure rating. Valves shall have **250-psig** minimum pressure rating if valves are components of high-pressure piping system.

B. Ball Valves: Comply with UL 1091, except with ball instead of disc.
   1. NPS 1-1/2 and Smaller: Bronze body with threaded ends.
   2. NPS 2 and NPS 2-1/2 Bronze body with threaded ends.

C. Butterfly Valves: UL 1091.
   1. NPS 2 and Smaller: Bronze body with threaded ends.
   2. NPS 2-1/2 and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with flanged ends.

D. Check Valves NPS 2 and Larger: UL 312, swing type, cast-iron body with flanged or grooved ends.

E. Gate Valves: UL 262, OS&Y type.
   1. NPS 2 and Smaller: Bronze body with threaded ends.
   2. NPS 2-1/2 and Larger: Cast-iron body with flanged ends.

F. Indicating Valves: UL 1091, with integral indicating device and ends matching connecting piping, post type with tamper switch.
   1. NPS 2-1/2 and Larger: Butterfly valve with cast or ductile-iron body; wafer type or with flanged or grooved ends.
      a. Available Manufacturers:
         1) Central Sprinkler Corp.
         2) Grinnell Fire Protection.
         3) Victaulic Co. of America.

2.06 UNLISTED GENERAL-DUTY VALVES

A. Ball Valves NPS 2 and Smaller: MSS SP-110, 2-piece copper-alloy body with chrome-plated brass ball, 600-psig minimum CWP rating, blowout-proof stem, and threaded ends.

B. Check Valves NPS 2 and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.

C. Gate Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, solid wedge, and threaded ends.

D. Globe Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

2.07 SPECIALTY VALVES

A. Sprinkler System Control Valves: UL listed cast- or ductile-iron body with flanged ends, and 175-psig minimum pressure rating, 250-psig minimum rating on high-pressure system.

B. Dry-Pipe Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Reliable Automatic Sprinkler Co., Inc.
      b. Tyco Fire & Building Products LP.
      c. Victaulic Company.
   2. Standard: UL 260
   3. Design: Differential-pressure type.
   4. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
   5. Air-Pressure Maintenance Device:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      b. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings comparable product by one of the following:
         1) Reliable Automatic Sprinkler Co., Inc.
         2) Victaulic Company.
      c. Standard: UL 260.
      d. Type: Automatic device to maintain minimum air pressure in piping.
      e. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig (95- to 410-kPa) adjustable range, and 300-psig (2070-kPa) outlet pressure.
   6. Air Compressor:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Gast Manufacturing Inc.
         2) General Air Products, Inc,
         3) Viking Corporation.
      b. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
      c. Motor Horsepower: Fractional.
      d. Power: 120-V ac, 60 Hz, single phase.

2.08 SPRINKLERS

A. Sprinklers shall be UL listed, with 175-psig minimum pressure rating, 250-psig minimum on high-pressure system.

B. Automatic Sprinklers: With heat-responsive element complying with the following:
   1. UL 199, for nonresidential applications.
   2. UL 1626, for residential applications.

C. Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.

D. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

E. Install only sprinklers listed for dry-pipe system on dry-pipe system.

2.09 BACKFLOW PREVENTERS

A. Double-Check, Backflow Preventers:
   1. Standard: ASSE 1048 and FMG approved or UL listed.
   2. Operation: Continuous-pressure applications.
   3. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
   4. Size: 6 NPS
   5. Body: 304 stainless steel.
   6. End Connections: Flanged.
   7. Configuration: Designed for horizontal, straight through flow.
   8. Accessories:
      a. Valves: Outside screw and yoke gate-type with flanged ends on inlet and outlet with tamper switch.

2.10 FIRE DEPARTMENT CONNECTION

A. Exposed, wall mounted, Fire Department Connection: UL 405, 175-psig minimum pressure rating; with corrosion-resistant-metal body, brass inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, and bottom outlet with pipe threads and knox box connections. Include engraved or painted metal signage indicating "AUTO SPKR & STANDPIPE."
   1. Finish Including Sleeve: Polished chrome-plated.

2.11 ALARM DEVICES

A. Electrically Operated Alarm: Exterior strobe and horn.

B. Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 250-psig pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

C. Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

2.12 PRESSURE GAGES

A. Description: UL 393, 3-1/2- to 4-1/2-inch diameter, dial pressure gage with range of 0 to 250 psig minimum.
   1. Water System Piping: Include caption "WATER" on dial face.

2.13 FIRE DEPARTMENT VALVE AT STANDPIPE

A. Cast brass, angle, red powder coated handwheel, pressure regulating type at high-pressure floors.

PART 3 - EXECUTION

3.01 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in Part 1 "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.02 PIPING APPLICATIONS, GENERAL

A. Shop weld pipe joints where welded piping is indicated.

B. Do not use welded joints for galvanized-steel pipe.

C. Flanges, flanged fittings, unions, nipples, and transition and special fittings with finish and pressure ratings same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.

D. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.

3.03 STANDPIPE SYSTEM PIPING APPLICATIONS

A. Wet-Type Standpipe System, 250-psig Maximum Working Pressure:
   1. NPS 5 and NPS 6 Threaded-end, black, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
   2. NPS 5 and NPS 6 Grooved-end, black, standard-weight steel pipe with roll-grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

3.04 WET SPRINKLER SYSTEM PIPING APPLICATIONS - EXPOSED PIPING ON ALL LEVELS, RISER PIPING AT SPRINKLER ENTRANCE, ALL SPRINKLER PIPING MAINS LARGER THAN 2-1/2", AND ALL PIPING CONNECTING TO STANDPIPE RISER THRU SPRINKLER FLOOR CONTROL VALVES AND DRAINS

A. Wet-Pipe Sprinkler System, 175-psig Maximum Working Pressure:
   1. NPS 1-1/2 and Smaller: Threaded-end, black, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
   2. NPS 2 Threaded-end, black, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
   3. NPS 2½ to NPS 8 Grooved-end, black, standard-weight steel pipe with roll-grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

3.05 WET SPRINKLER PIPING APPLICATIONS - CONCEALED PIPING FOR LIGHT HAZARD OCCUPANCY FOR LIGHT HAZARD

A. Wet-Pipe Sprinkler System NPS 2-1/2" and Smaller: CPVC equal to Blazemaster with approved cement joint fittings by same manufacturer as pipe.

B. Wet-Pipe Sprinkler System NPS 3" and Larger or in Hazard Occupancies higher than Light Hazard in areas greater than 400 square feet:
   1. NPS 1-1/2 and Smaller: Threaded-end, black, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
   2. NPS 2 Threaded-end, black, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
   3. NPS 2½ to NPS 8 Grooved-end, threadable, thinwall steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

3.06 DRY-SPRINKLER PIPING APPLICATIONS

A. Standard-pressure, dry-pipe sprinkler system, NPS 2-1/2 and smaller shall be the following:
   1. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.

3.07 JOINT CONSTRUCTION

A. Refer to Division 21 Section "Common Work Results for Fire Suppression" for basic piping joint construction.

B. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe smaller than NPS 8 (DN 200) with wall thickness less than Schedule 40 unless approved by authorities having jurisdiction and threads are checked by a ring gage and comply with ASME B1.20.1.

C. Grooved Joints: Assemble joints with listed coupling and gasket, lubricant, and bolts.
   1. Ductile-Iron Pipe: Radius-cut-groove ends of piping. Use grooved-end fittings and grooved-end-pipe couplings.
   2. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated.

D. Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials.
   1. NPS 2 and Smaller: Use dielectric unions, couplings, or nipples.
   2. NPS 2-1/2 to NPS 4 Use dielectric flanges.
   3. NPS 5 and Larger: Use dielectric flange insulation kits.

E. CPVC Joints: Construct joints using approved cement by manufacturer.

3.08 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression piping to water-service piping of size and in location indicated for service entrance to building.

3.09 PIPING INSTALLATION

A. Refer to Division 21 Section "Common Work Results for Fire Suppression" for basic piping installation.

B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
   1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

C. Install underground ductile-iron service-entrance piping according to NFPA 24 and with restrained joints.

D. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.

F. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install drain valves on standpipes.

K. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.

L. Install alarm devices in piping systems.

M. Hangers and Supports: Comply with NFPA 13 for hanger materials.
   1. Install standpipe system piping according to NFPA 14.
   2. Install sprinkler system piping according to NFPA 13.

N. Earthquake Protection: Install piping according to NFPA 13 to protect from earthquake damage.

O. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS ¼ and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

P. Fill wet-standpipe system piping with water.

Q. Fill wet-pipe sprinkler system piping with water.

R. Ensure chemical compatibility of CPVC pipe and fittings with internal coatings of steel pipe and utilized cutting oils.

S. Install sprinkler piping with drains for complete system drainage.

T. Connect compressed-air supply to dry-pipe sprinkler piping.

U. Connect air compressor to the following piping and wiring:
   1. Pressure gages and controls.
   2. Electrical power system.
   3. Fire-alarm devices, including low-pressure alarm.

V. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

W. Drain dry-pipe sprinkler piping.

X. Pressurize and check dry-pipe sprinkler system piping and air-pressure maintenance devices, air compressors.

3.10 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim, controls, and specialties according to NFPA 13 and NFPA 14 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:
   1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
   2. Dry-Pipe: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
      a. Install air compressor and compressed-air supply piping.
      b. Air-Pressure Maintenance Device: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.
      c. Install compressed-air supply piping from building's compressed-air piping system.

3.11 SPRINKLER APPLICATIONS

A. Drawings indicate sprinkler types and finishes to be used.

3.12 TESTING

A. All piping in the sprinkler system, both inside and outside of the building, shall be tested at a water pressure of 200 psi for a period of not less than two hours. All bracing shall be in place and air shall be removed from the system through the hydrants, drain valves, etc., before the test pressure is applied.

3.13 CLEANING

A. During the progress of the work, keep the premises reasonably clean as regards trash, debris, etc., caused by his materials and workmen. After all work has been completed and prior to final inspection, all equipment shall be thoroughly cleaned and all trash and debris removed from the job site.

3.14 INSTALLATION

A. All sprinkler work including the installation of underground fire main shall be installed by a Licensed Registered Fire Protection Contractor. Underground fire mains and hydrants shall be installed and in service prior to construction.

B. Install piping with ample flexibility to permit free expansion and contraction of pipework without putting excessive stress on piping, supports, or equipment, or causing damage or breakage. Do not bend any pipe. Ream pipe ends after cutting pipe. For threaded joints, use suitable non-hardening tape. Screw flanges to cast iron and ductile iron pipe; screw or weld flanges to steel pipe.

C. On underground pipe, adequately brace joints which are subject to separating under pressure, with concrete placed between firm trench walls and unbalanced sides of fittings, or set screw type retainer glands, or other suitable clamps or bridle rods, as applicable. Meet requirements of NFPA 24.

D. All pipe lines shall be laid straight and in true alignment in the lines and grades established on the Drawings.

E. Pipe passing under building grade beams shall have a 6 inch minimum clearance to prevent possible damage from building settlement.

F. Pipe passing through building walls, and building floors below grade shall be provided with sleeves of standard weight galvanized steel pipe. The annular spaces between pipe and sleeves shall be sealed with link seal hydro-static pipe wall seal. Sleeves shall be sized as follows:

3" pipe - 8" ID sleeve

4" pipe - 10" ID sleeve

6" pipe - 12" ID sleeve

G. Before permanently filling the site fire water system with water and before connections are made to the automatic sprinkler risers, all parts of the system to be thoroughly flushed until water runs clear. Minimum flow during flushing shall be as follows:

PIPE SIZE	FLOW GPM
3	300
4	400
6	750

H. Install sprinklers in suspended ceiling in center of acoustical ceiling panels and tiles, unless otherwise indicated on plans.

I. Do not install wet pendent or sidewall sprinklers in areas subject to freezing.

J. System shall be hydraulically calculated by a licensed sprinkler contractor.

K. All areas shown on the Architectural drawings shall be provided with automatic sprinkler protection.

L. Sprinkler heads subject to mechanical damage shall be provided with approved type wire guards.

M. All sprinkler heads installed for light hazard occupancy shall be quick response type in accordance with N.F.P.A. 13.

N. All underground sprinkler work including fire hydrants shall be installed and completed prior to building construction.

3.15 AS-BUILT DRAWINGS

A. Contractor shall keep an accurate record of the location of all site fire water lines and site potable water lines installed by him and shall provide Designer upon completion of work with a drawing showing all location dimensions and elevations.

3.16 HOSE-CONNECTION INSTALLATION

A. Install 2½" hose connections on standpipe, at intermediate landings.

B. Install hose connections for access and minimum passage restriction.

3.17 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install ball drip valve at each check valve for fire department connection.

3.18 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Connect water-supply piping to fire-suppression piping. Include backflow preventer between potable-water piping and fire-suppression piping.

D. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.

E. Connect alarm devices to fire alarm.

3.19 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14 .

3.20 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   3. Energize circuits to electrical equipment and devices.
   4. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
   5. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
   6. Coordinate with fire alarm tests. Operate as required.
   7. Coordinate with fire-pump tests. Operate as required.
   8. Verify that equipment hose threads are same as local fire department equipment.

B. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.21 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

END OF SECTION

SECTION 21 10 10
FIRE PROTECTION AND SPRINKLER - NFPA 13R
(BUILDINGS 2 THRU 9)

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Refer to section 220500, General Provisions, which shall also govern sprinkler and fire protection work.

B. General Provisions of the Contract, General and Supplementary Conditions and General Requirements apply to this section.

1.02 DESCRIPTION OF WORK

A. A complete sprinkler system shall be furnished and installed to insure the lowest insurance rate possible; however, no requirements of NFPA 13R, NFPA 24, Local Fire Marshal, State Fire Marshal, shall be violated and/or omitted.

B. It shall be the Contractors responsibility to examine all architectural drawings, sections, details and structural drawings to determine areas required to be sprinklered to meet applicable code requirements.

C. All cutting of holes necessary for the installation of work specified under this section of the specifications shall be done by this Contractor. Applicable provisions elsewhere in the specifications apply here, also. Cutting will be done under the supervision of the General Contractor. Do all patching of concrete, masonry and other materials which are cut by this Contractor, employing the services of the Contractor whose work is cut. Patching shall be of the same material and shall be finished neatly.

1.03 DRAWINGS

A. The drawings show and the specifications describe the work intended under this section, but the Contractor shall be solely responsible for taking his own measurements and installing the work to fit the conditions encountered everything necessary for a complete and satisfactory installation shall be furnished and installed by this Contractor performing work under this contract, whether or not specifically shown or specified. This is not intended to cover major items of equipment not shown or specified but is intended and will be interpreted to cover all miscellaneous parts, devices, accessories, controls, and appurtenances which are required by any applicable code, ordinance, regulation or law required to complete and place the system in satisfactory operation and required for a first class job which is complete in every respect.

B. Sprinklers shall be referred to on drawings, submittals, and other documentation, by the sprinkler identification or model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.

1.04 DEVIATIONS

A. No deviations from the plans and specifications shall be made without the full knowledge and consent of the Architect. Should this Contractor find at any time during the progress of the work that, in his judgement, existing conditions made desirable a modification in requirements covering any item he shall report such items to the Architect for his decision and instructions. No changes shall be made until written request has been made by the Contractor to the Architect and written approval of said change has been given by the Architect.

1.05 OMISSIONS

A. The drawings and specifications shall both be considered as part of the contract. Any work or material shown in one and omitted in the other shall be furnished and performed as though shown in both to give a complete sprinkler job approvable by the Authorities Having Jurisdiction. The awarding of the contract shall be construed to mean that this Contractor will install a complete and satisfactory system, furnishing all items of materials and labor to accomplish this

result whether or not such items are particularly specified or shown on plans. Should any discrepancy or omission be discovered in the plans or specifications, such must be reported to the Architect immediately in order that any necessary addenda may be issued before the bids are received.

1.06 LOCAL STANDARDS

A. Term, "Local Standards", as used herein, means the standards of design and construction of respective municipal (or county) department or utility company.

1.07 COOPERATION

A. This Contractor shall visit the job site and thoroughly inform himself as to the conditions under which the work is to be done.

B. Failure to route pipes through the building without interfering with other Contractor's equipment or construction and at maximum possible elevation shall not constitute a reason for an extra charge.

C. All equipment requiring service shall be made easily accessible.

1.08 PERMITS, LICENSES AND INSURANCE

A. The Contractor shall obtain and pay for all permits, licenses, fees, etc., required for his work.

1.09 SHOP DRAWINGS

A. Submit shop drawings to designer. Obtain stamped approved plans and letter of approval and then submit approved drawings to Authority Having Jurisdiction. No sprinkler work shall be done prior to all above approvals.

B. Submit 5 equipment submittals of all materials proposed for use in the work, giving name of manufacturer, trade name, catalog number and all information hereinafter requested. It is understood and agreed by all concerned that the Architect shall have the authority to reject any or all material, equipment or workmanship not complying with these specifications and that Contractor shall replace such rejected equipment, materials or workmanship upon notification by the Architect. Material or equipment rejected by the Architect shall be removed from the premises within twenty-four (24) hours after notification; otherwise, the Architect may have same removed at the Contractor's expense.

C. Submittal data and drawings shall be examined by the General Contractor prior to his transmitting to the above-mentioned authorities. The submittals shall bear the Contractor's stamp of approval evidencing that he has examined and checked same and that he found the information contained to be in accordance with the Contract requirements.

D. All materials and equipment furnished under this Section (210500) shall be new and approved by Underwriters' Laboratories, Inc. (UL), Factory Mutual (FM), or American Water Works Association (AWWA) where applicable.

1.10 GUARANTEE

A. The Contractor shall furnish a guarantee covering all labor and materials for a period of one year from date of acceptance of his work which shall include an agreement to repair replace and make good at his expense, any and all defects which may appear in his work or materials during that time, which in the judgement of the Architect arise from defective workmanship or imperfect or inferior materials.

PART 2 PRODUCTS

2.01 PIPING

A. Pipe and fittings, inside buildings for wet system: CPVC SDR 13.5 pipe and socket fittings equivalent to Blazemaster CPVC. Solvent cement shall meet requirements of ASTM F493.

2.02 SLEEVES, FERRULES AND ESCUTCHEONS

A. The Contractor shall furnish and install pipe sleeves for all piping installed under this section. Sleeves shall be located at all wall partitions and floor penetrations.

B. All floor and exterior wall sleeves shall extend 1-1/2" above finished floor and beyond exterior wall surface. The void space between pipe and sleeve shall be caulked with an approved type waterproof caulking material.

C. Pipe sleeves through partitions and interior walls shall be exact thickness and terminate flush with wall or partition finish.

D. Pipe sleeves shall be **STEEL** of equal wall thickness of standard pipe the size in question.

E. Provide chromium-plated escutcheon plates for all exposed pipes projecting through floors or walls.

2.03 FLANGES AND VALVES

A. Flanges: 125 pound cast iron threaded, or 150 pound steel slip-on welding neck, or threaded, as applicable, conforming to ANSI 816.1 and 816.5 respectively; flanges for cast iron and ductile iron pipe shall be properly sized for this pipe, and shall have counterbored long hubs completely covering pipe threads; standard steel bolts and nuts; and plain rubber gaskets.

B. Valves, Interior: Check valves shall be equal to Crane No. 375 UL approved flanged pattern iron body swing check valves. Cutoff valves shall be equal to Crane No. 467 UL flanged pattern outside screw and yoke wedge gate valves. Cutoff valves up to 2" shall be bronze Crane No. 459 cut off valves; 2-1/2 and 3" shall be No. 467-1/2, 4" to 6" shall be equal to CLOW #F-5733.

C. Backflow preventer shall be double check type, flanged 150 psi working pressure with two OS&Y shut-off valves. The backflow preventer shall meet all requirements of the University of South California Foundation of Cross Connection Control and AWWA Standard C506. The backflow preventer shall also be tested and listed by UL and/or FM. A factory representative shall supervise and inspect the installation of the backflow preventer. After the installation has been approved by the factory representative, the factory representative shall send a formal letter of approval to the Architect.

2.04 DRAIN VALVES

A. Provide drain and test valves as required in accordance with NFPA 13R.

2.05 FIRE DEPARTMENT CONNECTION

A. Fire Department Connection (Wall Type): Single outlet, 1 ½" minimum with chrome plated knox box cap. Provide ball drip.

2.06 ELECTRIC SWITCHES AND ALARM

A. Provide all valves with tamper switches containing electrical contacts for supervision, and be connected to fire alarm system.

B. Provide horn and strobe or 9" diameter electric bell as required by Authority Having Jurisdiction for local alarm.

C. All electrical power wiring and interlock wiring will be provided and installed by the electrical contractor.

2.07 HANGER AND SUPPORTS

A. All piping shall be supported with UL approved hangers, types and sizes required, Grinnell or equal. Hangers shall be attached to structural steel work by clamping or other approved methods, except that structural steel works shall not be drilled or punched. Wherever necessary, furnish install and securely anchor to or between building members suitable angle iron or others steel members to support sprinkler work.

2.08 SPRINKLER HEADS, EXTRA SPRINKLER CABINET

A. Sprinkler heads shall be proper types, ratings and spacings for the areas involved. Provide 1 sprinkler cabinet with (6) extra sprinkler heads and sprinkler wrench for emergency use, located in riser room.

PART 3 EXECUTION

3.01 TESTING

A. All piping in the sprinkler system shall be tested at a water pressure of 200 psi for a period of not less than two hours. All bracing shall be in place and all air shall be removed from the system through the hydrants, drain valves, etc., before the test pressure is applied.

3.02 CLEANING

A. During the progress of the work, keep the premises reasonably clean as regards trash, debris, etc., caused by his materials and workmen. After all work has been completed and prior to final inspection, all equipment shall be thoroughly cleaned and all trash and debris removed from the job site.

3.03 INSTALLATION

A. All sprinkler work shall be installed by a Licensed Registered Fire Protection Contractor.

B. Install piping with ample flexibility to permit free expansion and contraction of pipework without putting excessive stress on piping, supports, or equipment, or causing damage or breakage. Do not bend any pipe.

3.04 AS-BUILT DRAWINGS

A. Contractor shall keep an accurate record of the location of all site fire water lines and site potable water lines installed by him and shall provide Owner upon completion of the work with a drawing showing all location dimensions and elevations.

3.05 SPRINKLER SYSTEM

A. Systems shall be wet system as required by N.F.P.A. 13R.

B. Head spacing to be ordinary hazard - light hazard as required by N.F.P.A. 13.

C. System shall be hydraulically calculated by a licensed sprinkler contractor.

D. Sprinkler heads subject to mechanical damage shall be provided with approved type wire guards.

E. Sprinkler and fire lines shall be run in concealed ceiling space and listed residential semi-recessed white pendent sprinkler heads utilized in all areas that have finished ceilings.

F. Areas that do not have a finished ceiling, sprinkler, and fire lines shall be exposed; and brass upright sprinkler heads shall be used.

G. All sprinkler heads installed for light hazard occupancy shall be quick response type in accordance with N.F.P.A. 13.

H. Sprinkler piping routed in areas subject to freezing shall be protected with insulation in accordance with NFPA 13R and details on drawing.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE

A. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

B. Electrical Characteristics for Plumbing Equipment: Contractor shall verify existing voltage available at the site prior to ordering equipment. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.04 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete, masonry walls and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces.

D. All equipment shall be installed in accordance with the manufacturer's drawings and recommendations.

E. The Contractor shall furnish and install all rough-in work and make final connections to all equipment requiring water, drains, and other mechanical work required for connection to equipment furnished under this contract.

F. The equipment shall be properly prepared structurally and mechanically ready to receive a single connection for each of the various mechanical items with all plumbing, piping drains, traps, tailpieces, supply fittings, etc., internal to and part of the equipment installed by the equipment manufacturer or supplier.

1.05 CODES AND FEES

A. All work shall be installed in accordance with the applicable provisions of the local codes, latest adopted International Plumbing Code, UL, AWWA, ASTM, ASME and ANSI.

B. The Contractor shall pay for fees and inspections as may be required for water, sanitary sewer and gas service, and all other systems requiring inspection by agencies having jurisdiction.

1.06 ELECTRICAL WORK

A. All control wiring and conduit not shown on Electrical drawings shall be furnished and installed under Division 22 according to the National Electrical Code and Division 26 requirements.

B. All power wiring and conduit for items furnished under Division 22 shall be furnished and installed under Division 26.

C. All disconnects shall be furnished and installed by Division 26.

D. Toggle switches for 1/2 HP motors and less shall be furnished and installed by Division 26.

E. Wiring and conduit for solenoid valves, and control transformers including the transformers shall be furnished and installed by Division 22.

F. Division 26 shall install all starters, toggle switches, disconnects, and all wiring to the respective motor or device. Wiring and conduit from starter to a controller shall be by Division 22.

G. Definitions:
   1. Power wiring: Line voltage circuitry rough-in including conduit, boxes, conductors, etc. between the overcurrent protection and the equipment including the connection of the starters.
   2. Control wiring: Any voltage circuitry rough-in including conduit, boxes, conductors, etc. between control activator and the controller or starter.

H. Conduit: All power wiring and 120V control wiring shall be in conduit. Low voltage control wiring shall be installed in conduit where exposed, or in return air plenums, in masonry walls, or below slab.

I. It shall be the Contractor's responsibility to determine the characteristics of electrical currents available to operate the mechanical equipment prior to ordering such equipment. All electrically operated equipment shall be designed for operation with the type of electric current available to the project.

1.07 RECORD DRAWINGS

A. The Contractor shall maintain a marked up set of prints that reflect site conditions including location of valves, underground piping, equipment, etc. that have been changed to suit job conditions. Final payment shall not be made until such document(s) is turned over to the architect upon completion of the project.

1.08 SEISMIC DESIGN

A. Seismic restraints shall be provided in accordance with Chapter 16 of the latest adopted International Building Code. Specific seismic requirements shall be determined by building site classification.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.02 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
   2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy unless otherwise indicated.

F. Solvent Cements for Joining Plastic Piping:
   1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.03 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials, installed between dissimilar metals.

B. Unions shall be installed on each side of all special valves, regulators, etc., on one side of each check valve and each trap, and at all equipment such as coils, tanks, compressors, pumps, etc., so that such equipment may be readily disconnected. No unions shall be placed in a location which will be inaccessible after completion of the building.

C. Where flanged valves, regulators, etc., do not permit the removal of flange bolts, two such devices shall be separated by a spool. (3) Connections between pipes of dissimilar metals shall be made with Dielectric (insulated) unions.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
   1. Available Manufacturers:
      a. Capitol Manufacturing Co.
      b. Watts Industries, Inc.; Water Products Div.
      c. Zurn Industries, Inc.; Wilkins Div.

E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
   1. Available Manufacturers:
      a. Capitol Manufacturing Co.
      b. Epco Sales, Inc.
      c. Watts Industries, Inc.; Water Products Div.

2.04 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
   1. Available Manufacturers:
      a. Advance Products & Systems, Inc.
      b. Metraflex Co.
      c. Pipeline Seal and Insulator, Inc.
   2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   3. Pressure Plates: Plastic. Include two for each sealing element.
   4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.05 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
   1. Underdeck Clamp: Clamping ring with set screws.

2.06 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

2.07 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

2.08 FIRE STOPPING

A. Description: Fire stopping compounds, caulks, wraps, as required to maintain integrity of fire rated floors, ceilings, walls and floor/ceiling, roof ceiling assemblies for all pipe penetrations for metal and plastic pipe.
   1. Available manufacturer's:
      a. 3M Corporation
      b. Hilti
      c. Pro-Set
   2. See plumbing drawings for U.L. system numbers and specific penetration details.

2.09 ACCESS PANELS

A. Description: For ceiling applications utilize 16 gauge bonderized steel door frame with prime coat finish, 20 gauge bonderized steel door panel with prime coat finish, automatic closure, self-latch, interior latch release, rated as required for ceiling construction. For wall applications utilize the following:
   1. Block Walls and Drywall – 14 gauge galvanized steel frame with 16 gauge door panel, concealed hinge, key operated lock. Fire rating shall be consistent with wall construction.
   2. Available manufacturer's:
      a. Elmore Manufacturing Company
      b. Milcor Products, Inc.
      c. Amberaproducts, Inc.

PART 3 - EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas. Run piping parallel to principle parts of the building and avoid diagonal runs unless specifically indicated on plans.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping and hangers to allow application of insulation.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install escutcheons for penetrations of walls, ceilings, and floors chrome plated, metal at all visible locations:

K. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs. Refer to specific details for sleeves thru fire rated floors and walls.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
   2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
   3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
      a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
      b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
      c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
   4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint.

L. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

M. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to details on plumbing drawings for U.L. system numbers and specific penetration types.

N. Verify final equipment locations for roughing-in.

O. Verify exact required rough-in dimensions with equipment manufacturer.

3.02 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to manufacturer's instructions.

I. Cold Expansion Joints: Construct utilizing only PEX manufacturer's approved tool and expansion bit.

3.03 PIPE PRESSURE TESTING

A. Test all plumbing piping, following installation, but before it is covered or connected to the sewers or fixtures. Furnish necessary labor, materials and equipment for making test. All leaks disclosed by testing shall be reworked in an approved manner and the leaking system shall then be retested until proved tight under pressure. Test all systems for watertightness as required by the authorities having jurisdiction, or in the absence of such requirements the minimum tests shall be made as follows:

1. Fill all storm and sanitary drainage and vent piping with water and allow to stand thus filled for 3 hours without showing leaks. Piping may be tested in sections, but no sections shall be tested with less than a ten foot head. Air pressure testing with equivalent pressure is acceptable when cast iron piping is utilized. Plastic piping will not be permitted to be tested with air.
2. Test all water supply piping by applying a hydro-static pressure of not less than 125 pounds per square inch or 1½ times the working pressure, whichever is greater.

3.04 EXCAVATING AND BACKFILLING

A. Do all excavating and backfilling required for the installation of underground work required by the plumbing work.

B. Width of trench shall be not less than 18" wider than the pipe outside diameter. Minimum cover over top of water pipe shall not be less than the frost line for the area plus 6". Minimum cover for gas piping, sanitary sewer, and storm sewer shall be not less than 24". Fire service mains shall have minimum 36" cover.

C. Copper piping, shall be laid on a 6" bed of sand and backfilled with sand to 12" above top of pipe. Complete backfilling with Washed #57 Stone to underside of building slab and outside of building to underside of pavement. The balance of the fill outside the building not under pavement shall be clean earth thoroughly tamped and crowned, void of stones larger than 4" diameter to allow for subsequent settlement. Compact to 100% density under buildings and paved areas. Protect copper piping at building slab penetration with sleeve or ½" thick "Armaflex" insulation.

D. PVC piping, shall be laid on a 6" bed of Washed #57 Stone and backfilled with same stone to 12" above top of pipe. Complete backfilling with Washed #57 Stone to underside of building slab and outside of building to underside of pavement. The balance of the fill outside the building not under pavement shall be clean earth thoroughly tamped and crowned, void of stones larger than 4" diameter to allow for subsequent settlement. Compact to 100% density under buildings and paved areas.

E. All trenches shall be braced as required to protect workmen and adjacent work. Comply with local regulations.

3.05 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.

D. Install equipment to allow right of way for piping installed at required slope.

3.06 PIPE PROTECTION

A. In concealed locations where piping, other than cast-iron or galvanized steel, is installed through holes or notches in studs, joists, rafters or similar members less than 1-1/2" from the nearest edge of the member, the pipe shall be protected by steel plates. Such shield plates shall have a minimal thickness of 0.0575 inch (No. 16 gage). Such plates shall cover the area of the pipe where the member is notched or bored, and shall extend not less than 2" above sole plates and below top plates.

3.07 ACCESS PANELS

A. Furnish steel access panels, not smaller than 12" for single valve and 12" X 24" or 18" X 18" for two or more valves, for access of concealed valves, traps, clean outs, unions, etc., where no other means of access is shown or specified. Access panels shall be turned over to the general contractor for installation. Contractor shall include in their bid all costs charged by the general contractor for installation.

B. Access panels in fire rated construction shall have a UL label Class B rating. All panel styles to be verified by the Designer.

3.08 GUARANTEE

A. The Contractor shall guarantee all work to be in accordance with contract requirements and free from defective or inferior materials, equipment, and workmanship for a period of one year, and he shall guarantee that all equipment is of proper size and design and so installed as to produce the capacities and results specified and shown on the drawings.

B. PEX piping warranty shall be for 25-Years and shall cover pipe, pipe fittings, and property damage caused by failure.

3.09 SUBSTITUTIONS

A. Substitutions shall be allowed in accordance with Division 1. Substitution approval shall be at the sole discretion of the Engineer.

B. Contractor shall note on shop drawings all major differences from specified material or equipment.

C. The contractor shall be responsible to verify that all dimensions, weights, electrical and mechanical requirements of substituted materials and equipment meet project requirements. Any required modifications to other trades for substituted equipment shall be the responsibility of the contractor making the substitution.

D. All requests for substitution must be submitted to the architect and engineer a minimum of 14 calendar days prior to project bid date. Such submission does not constitute approval. Only items or manufacturers specifically stated in the project specifications, drawings or addenda for use shall be considered as approved.

3.10 SHOP DRAWINGS

A. Submit to the Architect for approval, within 30 days after receipt of Notice to Proceed with the work, detailed shop drawings of all equipment and all material required to complete the project. The shop drawing shall be complete as described herein. The Contractor shall furnish the number of copies required by the General and Special Conditions of the Contract, but in no case less than six (6) copies. Electronic shop drawings are acceptable.

B. All shop drawings to be submitted at one time in a 3-ring binder with cover and drawing index sheet, or one electronic submission.

C. The shop drawings shall be detailed, with dimensioned drawings or catalog cuts, showing construction, size, arrangement, operating clearances, performance characteristics and capacity. Each item of equipment proposed shall be a standard catalog product of an established

manufacturer and of equivalent quality, finish, and durability to that specified. Submission material and all shop drawings for the various items of equipment shall be marked with the respective mark number or identification of the equipment shown on the drawing or in the specification.

D. Provide a cover sheet for all major equipment, including but not limited to, pumps, plumbing fixtures, water heaters, that shall list in detail all accessories called for in specifications and on drawings that are being supplied. Failure to list these items will result in resubmittal. A copy of a standard catalog will not be sufficient.

E. Shop drawings shall show sizes and details of required concrete and steel machine foundation, location of anchor bolts, physical dimension of equipment, equipment weight or other pertinent data required for equipment support or installation.

F. The contractor shall verify all electrical requirements of equipment with the electrical service available before ordering said equipment.

G. Approved shop drawings do not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings or specifications.

H. All shop drawings to be reviewed must bear the general contractor's stamp indicating they have reviewed the items being submitted and their approval/comments attached. Submission without this stamp is grounds for rejection of the submittal package.

END OF SECTION

SECTION 22 05 05

GENERAL-DUTY VALVES FOR DOMESTIC WATER

PART 1 - GENERAL

1.01 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.02 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set ball and plug valves open to minimize exposure of functional surfaces.
   4. Set butterfly valves closed or slightly open.
   5. Block check valves in either closed or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

1.03 SUBMITTALS

A. Product Data: For all valves listed herein.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
   1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
   2. Butterfly Valves: With extended neck.

E. Valve-End Connections:
   1. Flanged: With flanges according to ASME B16.1 for iron valves.
   2. Solder Joint: With sockets according to ASME B16.18.
   3. Threaded: With threads according to ASME B1.20.1.

F. Valve Bypass and Drain Connections: MSS SP-45.

2.02 BRASS OR BRONZE BALL VALVES

A. Two-Piece, Full-Port, Brass or Bronze Ball Valves with Brass or Bronze Trim:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Conbraco Industries, Inc.; Apollo Valves.
      b. Milwaukee Valve Company.
      c. NIBCO INC.
      d. Valves in PEX piping shall be by same manufacturer as PEX piping.
   2. Description:
      a. Standard: MSS SP-110.
      b. SWP Rating: 150 psig.

c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze or forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze or brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

B. Three-Piece, Full-Port, Brass or Bronze Ball Valves with Brass Trim:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Valves in PEX piping shall be by same manufacturer as PEX piping.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Three piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

2.03 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. Valves in PEX piping shall be by same manufacturer as PEX piping.
2. Description:
a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

2.04 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Kitz Corporation.
b. Milwaukee Valve Company.

c. NIBCO INC.

2. Description:
   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 300 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded.
   f. Disc: Bronze.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.02 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.

3.03 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.04 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
   1. Shutoff Service: Ball, butterfly valves.
   2. Butterfly Valve Dead-End Service: Single-flange (lug) type.

B. Select valves, except wafer types, with the following end connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
   2. For Copper Tubing, NPS 2-1/2 and Larger: Flanged ends.
   3. For PEX piping NPS 3 and smaller: Male PEX cold joint connections.

3.05 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
   1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Ball Valves: Two piece, full port, brass or bronze with bronze trim.
   3. Ball Valves: Three piece, full port, brass or bronze with bronze trim.
   4. Bronze Swing Check Valves: Class 150, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.

END OF SECTION

SECTION 22 05 10

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.02 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

B. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."

PART 2 - PRODUCTS

2.01 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:
   1. B-Line Systems, Inc.; a division of Cooper Industries.
   2. Grinnell Corp.
   3. Globe Pipe Hanger Products Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.02 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.03 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Insulation-Insert Material: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for cold piping operating below ambient air temperature.

2.04 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
   1. Available Manufacturers:
      a. B-Line Systems, Inc.; a division of Cooper Industries.
      b. Hilti, Inc.
      c. ITW Ramset/Red Head.

2.05 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.06 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.01 HANGER AND SUPPORT APPLICATIONS

A. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

B. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

C. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

3.02 PIPING SUPPORT

A. Support spacing of piping hangers shall not exceed the following:
   1. Copper Tube:
      a. 1-1/4 NPS and smaller – 6’ horizontal – 3/8” rod dia., 10’ vertical.
      b. 1-1/2 NPS and 2 NPS – 10’ horizontal – 3/8” rod dia., 10’ vertical.
      c. 2-1/2 NPS and 3 NPS – 10’ horizontal – ½” rod dia., 10’ vertical.
      d. 4 NPS – 10’ horizontal – 5/8” rod dia., 10’ vertical.
      e. 6 NPS – 10’ horizontal – ¾” rod dia., 10’ vertical.
   2. PEX piping continually supported with manufacturer’s banded, galvanized channel support:
      a. ½ NPS and ¾ NPS – 6’ horizontal – 3/8” rod dia., 10’ vertical plus mid-story guide (no channel support on vertical.
      b. 1 NPS thru 2 NPS – 8’ horizontal – 3/8” rod dia., 10’ vertical plus mid-story guide (no channel support on vertical).
      c. 2-1/2 NPS and 3 NPS – 8’ horizontal – ½” rod dia., 10’ vertical (no channel).
   3. PEX piping, Bare:
      a. ½ NPS thru 2 NPS – 32” horizontal – 3/8” rod dia., 10’ vertical plus mid-story guide.
      b. 2-1/2 NPS and 3 NPS – 32” horizontal – ½” rod dia., 10’ vertical plus mid-story guide.
   4. Cast iron pipe, hubless, service weight:
      a. 2 NPS - 10’ horizontal (10’ pipe lengths installed) – 3/8” rod dia., 15’ vertical.
      b. 3 NPS and 4 NPS – 10’ horizontal (10’ pipe lengths installed) – ½” rod dia., 15’ vertical.
      c. 6 NPS and 8 NPS – 10’ horizontal (10’ pipe lengths installed) – ¾” rod dia., 15’ vertical.
   5. PVC, Schedule 40:
      a. ½ NPS thru 2 NPS – 4’ horizontal – 3/8” rod dia., 10’ vertical plus mid-story guide.
      b. 3 NPS – 4’ horizontal – 1/2” rod dia., 10’ vertical plus mid-story guide.
      c. 4 NPS – 4’ horizontal – 5/8” rod dia., 10’ vertical plus mid-story guide.
      d. 6 NPS and 8 NPS – 4’ horizontal – ¾” rod dia., 10’ vertical plus mid-story guide.
      e. 10 NPS – 4’ horizontal – 7/8” rod dia., 10’ vertical plus mid-story guide.
   6. Sway Bracing:
      a. Provide rigid sway support bracing at changes in direction greater than 45 degrees for pipe sizes 4” and larger.

B. Horizontal-Piping Hangers and Supports: Unless otherwise indicated, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, all sizes.
   2. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): Acceptable for suspension of noninsulated steel pipes, NPS 1/2 to NPS 2 noninsulated PEX pipe, NPS ½ and NPS 3/4.
   3. Trapeze hangers may be utilized where multiple pipes are to be installed side by side at same elevation.

3.03 ATTACHMENTS

A. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
   2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
   3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
   4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

B. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, support
   1. From concrete using inserts
   2. From beams using beam clamps, rivets or bolts
   3. From blocks using toggle or thru-bolts.
   4. Do not use plastic anchors, adhesives or explosive charges.
   5. Do not support from roof deck.
   6. Fasten supports to building in the following order of preference:
      a. Steel Framing
      b. Concrete
      c. Masonry
      d. Wood Sheathing
   7. All hangers, rods and inserts shall be UL approved for service intended and shall be the following types per MSS SP-58:
      a. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
      b. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
      c. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
      d. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
      e. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
      f. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
      g. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
      h. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
      i. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
         1) Light (MSS Type 31): 750 lb.
         2) Medium (MSS Type 32): 1500 lb.
         3) Heavy (MSS Type 33): 3000 lb.
      j. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

C. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Protection Shields (MSS Type 40): 12 Inch minimum length or of length recommended by manufacturer to prevent crushing insulation, if greater.
   2. Steel Pipe-Covering Protection Saddles, for rollers (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

3.04 HANGER AND SUPPORT INSTALLATION

A. On all pipe, provide hanger within 18” of each elbow or fitting and within 18” of connection to each piece of equipment.

B. Pipes passing through walls shall not bear on construction.

C. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:
   1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide specified slope for drainage piping.

M. Insulated Piping: Comply with the following:
   1. When pipes carry material colder than 90 deg F, provide shields at each hanger. On 2½” and larger pipe, insulated with fiberglass, provide thermal hanger shield insert.
   2. Install MSS SP-58, Type 40, protective shields on all insulated piping. Shields shall span an arc of 180 degrees. Use MSS SP-58.
      a. Option: Thermal-hanger shield inserts may be used.
   3. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
      b. NPS 4 and larger: 12 inches long and 0.06 inch thick.
   4. Thermal-Hanger Shields: On pipes 2-1/2” or larger, install with insulation same thickness as piping insulation.

3.05 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

D. Cut, drill, and fit miscellaneous metal fabrications for equipment supports. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

E. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.06 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support.

3.07 PAINTING

A. Touch Up: Clean and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 22 05 15

IDENTIFICATION FOR PLUMBING PIPING & EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Equipment labels.
   2. Warning signs and labels.
   3. Pipe labels.
   4. Valve tags.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated herein.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.04 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
   2. Letter Color: White.
   3. Background Color: Black.
   4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
   5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
   6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   7. Fasteners: Stainless-steel rivets or self-tapping screws.
   8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper, tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number

and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.02 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, acceptable manufacturers offering products that may be incorporated into the Work include, but are not limited to, to those specified.
   1. Craftmark Duramark
   2. Seton Set Mark

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned, Snap-Around Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: Minimum 1-1/2 inches high.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.03 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 30 feet along each run. Reduce intervals to 15 feet in areas of congested piping and equipment.
   7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:
   1. Domestic Water Piping – Cold Water:
      a. Background Color: Green.
      b. Letter Color: White.
   2. Sanitary Waste, Storm Drainage, Secondary Storm Drainage, And Condensate Drainage Piping:
      a. Background Color: Green.
      b. Letter Color: White.
   3. Domestic Water Piping – Hot Water:

a. Background Color: Yellow.
b. Letter Color: Black.

END OF SECTION

SECTION 22 05 20

PLUMBING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Insulation Materials:
      a. Mineral fiber.
      b. Flexible Elastomeric.
   2. Insulating cements.
   3. Adhesives.
   4. Mastics.
   5. Sealants.
   6. Factory-applied jackets.
   7. Tapes.
   8. Securements.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated herein. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Skilled, qualified tradesmen who are employed by a company whose sole business is the sale and installation of commercial/industrial insulation. This company shall have been in business a minimum of 10 years. Plumbing contractors shall not install insulation.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.06 COORDINATION

A. Coordinate size and location of insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing, where/if heat tracing is required.

1.07 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Mineral-Fiber, Preformed Pipe Insulation:
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Johns Manville Micro-Lok.
      b. Knauf Insulation.
      c. Owens Corning Fiberglas Pipe Insulation.
   2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

D. FLEXIBLE TUBULAR ELASTOMERIC
   1. Provide fire-retardant, closed-cell, slip-on flexible type. Product must be guaranteed by manufacturer to have continuous operational temperature limits between -297°F and +220°F, with a minimum “R” value of 3.57 at 75° F 50% RH.
   2. Products: Subject to compliance with requirements, available manufacturers that may be incorporated into the Work include, but are not limited to, the following:
      a. Aeroflex USA, Inc.
      b. Armacel, Inc.
      c. Rubatex, Inc.

E. Polyolefin
   1. Polyolefin insulation Is Not permitted to be used on this project.

2.02 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Products, Division of ITW; CP-82.
      b. Foster Products Corporation, H. B. Fuller Company; 85-20.
      c. Marathon Industries, Inc.; 225.

C. FLEXIBLE TUBULAR ELASTOMERIC ADHESIVE:
   1. Utilize Insulation Manufacturer’s recommended contact adhesive.

D. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Products, Division of ITW; CP-82.
      b. Foster Products Corporation, H. B. Fuller Company; 85-20.
      c. Marathon Industries, Inc.; 225.

2.03 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Products, Division of ITW; CP-35.
      b. Foster Products Corporation, H. B. Fuller Company; 30-90.
      c. Marathon Industries, Inc.; 590.
   2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
   3. Service Temperature Range: Minus 20 to plus 180 deg F.
   4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
   5. Color: White.

2.04 SEALANTS

A. Metal Jacket Flashing Sealants:
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Products, Division of ITW; CP-76-8.
      b. Foster Products Corporation, H. B. Fuller Company; 95-44.
      c. Marathon Industries, Inc.; 405.
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Fire- and water-resistant, flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 40 to plus 250 deg F.
   5. Color: Aluminum.

2.05 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
   2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.06 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Metal Jacket:
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Products, Division of ITW; Metal Jacketing Systems.
      b. PABCO Metals Corporation; Surefit.
      c. RPR Products, Inc.; Insul-Mate.
   2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
      a. Sheet and roll stock ready for shop or field sizing.
      b. 0.016 Inch thickness.
      c. Factory-Fabricated Fitting Covers:
         1) Same material, finish, and thickness as jacket.
         2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
         3) Tee covers.
         4) Flange and union covers.
         5) End caps.
         6) Beveled collars.
         7) Valve covers.
         8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.07 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
      b. Compac Corp.; 104 and 105.
      c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
   2. Width: 3 inches.
   3. Thickness: 11.5 mils.
   4. Adhesion: 90 ounces force/inch in width.
   5. Elongation: 2 percent.
   6. Tensile Strength: 40 lbf/inch in width.
   7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.08 SECUREMENTS

A. Bands:
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Products; Bands.
      b. PABCO Metals Corporation; Bands.
      c. RPR Products, Inc.; Bands.
   2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
   1. Verify that systems and equipment to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. At vapor barrier, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with mastic or sealing compound recommended by insulation material manufacturer.
   2. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Install insulation continuously through hangers and around anchor attachments. All hangers shall be of a type that will allow insulation products to be installed in an un-interrupted manner, without breaks or disruptions in the integrity of the vapor barrier.

L. Apply mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints. Do not staple on PEX piping.

P. Insulate base of all primary and secondary roof drains.

3.04 PENETRATIONS

A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
   4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

E. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies.

3.05 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves and Flanges:

1. Install insulation over fittings, valves and flanges with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate copper pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate stick type PEX pipe elbows utilizing glass fiber blanket inserts with matching PVC covers.
4. Insulate tee fittings with sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
5. Insulate valves using sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
6. Insulate flanges using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with mastic. Install a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using matching PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant, for a vapor tight seal.

3.06 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
2. For insulation with factory-applied jackets, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.07 FLEXIBLE TUBULAR ELASTOMERIC PIPING INSULATION INSTALLATION

A. Insulation installation on straight pipes and tubes:
1. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. All terminations, seams and butt joints shall be adhered and sealed using manufacturer recommended adhesive.
2. Insulation shall be pushed on the pipe, never pulled. Stretching of insulation will result in open seams and joints.
3. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp knives must be used.
4. On cold piping insulation shall be adhered directly to the piping at the high end of the run using a one inch strip of Adhesive on the ID of the insulation and on the pipe.
5. Sheet insulation shall be used on all pipes larger than 6” IPS. Insulation shall not be stretched around the pipe.
6. Seams shall be staggered when applying multiple layers of insulation.
7. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seams and mitered joints shall be adhered with Adhesive. Screwed fittings shall be sleeved and adhered with a minimum one inch overlap onto the adjacent insulation.

3.08 FIELD-APPLIED JACKET INSTALLATION

A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.09 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water, Hot Water and Recirculated Hot Water: Copper, Stick Type PEX.
1. All sizes, insulation shall be the following:
a. Mineral-Fiber, Preformed Pipe Insulation: 1 inch thick.

B. Domestic Cold Water, Hot Water: PEX, Roll Type.
1. ½ and ¾ NPS, Insulation shall be the following:
a. Flexible Tubular Elastomeric: ½ Inch Thick.
b. PEX piping inside resident room stud partitions need not be insulated.

C. Horizontal Rainwater Leaders and Secondary Roof Drainage System:
1. All Pipe Sizes: Insulation shall be the following:
a. Mineral-Fiber, Preformed Pipe Insulation: 1 inch thick.
b. Horizontal piping above grade routed overhead in parking garage need not be insulated.

D. Cold Condensate Drain:
1. All Pipe Sizes: Insulation shall be the following:
a. Flexible Elastomeric Insulation: ½” inch thick.

E. Sanitary Sewer Piping Overhead In Parking Garage:
1. Exposed Drain Traps:
a. All pipe sizes: Mineral Fiber, Preformed Pipe Insulation: ½ inch thick.
b. Provide and install heat trace below insulation on exposed drain traps.

3.11 OUTDOOR, ABOVEGROUND WATER PIPING INSULATION SCHEDULE.

A. Increase insulation thickness by ½ Inch and provide protective aluminum jacketing.

3.12 FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. Provide for the following:
   1. Insulated Piping, outside, above-ground: Aluminum, Stucco Embossed: 0.016 inch thick.
   2. Insulated Piping exposed in all rooms, within 7 feet of floor: Aluminum, Stucco Embossed: 0.016 inch thick.

END OF SECTION

SECTION 22 05 25

DOMESTIC WATER PIPING AND APPURTENANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUBMITTALS

A. Product Data: For the following products:
   1. Backflow preventers.
   2. Water Pressure-Reducing Valves.
   3. Pressure gauges.
   4. Strainers for domestic water piping.
   5. Wall Hydrants.
   6. Water hammer arresters.
   7. Cross Linked Polyethylene Piping (PEX).

1.03 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.02 PIPE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
   1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
   2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
   3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
   4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. Soft Copper Tube: ASTM B88, Type “K”, soft drawn.
   1. Wrought copper solder-joint fittings; and brazed joints.

C. Type “A” cross linked polyethylene (PEX): Cold expansion joint fittings.

2.03 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

E. PEX Cold Expansion Joint Fitting: ASTM F1960.

2.04 SPECIALTY VALVES

A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

B. Valves in PEX piping systems shall be of same manufacturer as PEX piping system.

2.05 TRANSITION FITTINGS

A. General Requirements:
   1. Same size as pipes to be joined.
   2. Pressure rating at least equal to pipes to be joined.
   3. End connections compatible with pipes to be joined.

2.06 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ames Co.
      b. FEBCO; SPX Valves & Controls.
      c. Watts Industries, Inc.; Water Products Div.
   2. Standard: ASSE 1001.
   3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
   4. Body: Bronze.
   5. Inlet and Outlet Connections: Threaded.
   6. Finish: Chrome plated.

2.07 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. FEBCO; SPX Valves & Controls.
      b. Watts Industries, Inc.; Water Products Div.
      c. Zurn Plumbing Products Group; Wilkins Div.
   2. Standard: ASSE 1013.
   3. Operation: Continuous-pressure applications.
   4. Size: ½" – 4".
   5. Body: Bronze for NPS 2 and smaller; ductile iron for NPS 2-1/2 and larger.
   6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
   7. Configuration: Designed for horizontal, straight through flow.
   8. Accessories:
      a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
      b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.08 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Conbraco Industries, Inc.
      b. Watts Industries, Inc.; Water Products Div.
      c. Zurn Plumbing Products Group; Wilkins Div.
   2. Standard: ASSE 1003.
   3. Pressure Rating: 300 PSIG (2070 kPa).
   4. Size: 4" NPS and smaller
   5. Body: Bronze for NPS 3 and smaller.
   6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and above.

2.09 PRESSURE GAUGES

A. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
      b. Trerice, H. O. Co.
      c. Weiss Instruments, Inc.
   2. Case: Dry type, drawn steel or cast aluminum, 4-1/2-inch diameter.
   3. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
   4. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
   5. Movement: Mechanical, with link to pressure element and connection to pointer.
   6. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
   7. Pointer: Red or other dark-color metal.
   8. Window: Glass or plastic.
   9. Accuracy: Plus or minus 2 percent of middle half scale.
   10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
   11. Range for Fluids under Pressure: Two times operating pressure.

B. Pressure Gauge Fittings:
   1. Valves: NPS ¼ brass or stainless-steel needle type.
   2. Snubbers: ASM B-40.5, NPS ¼ brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.10 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:
   1. Available Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Watts Industries, Inc.
      b. Zurn Plumbing Products; Wilkins Division
      c. Apollo
   2. Pressure Rating: 125 psig minimum, unless otherwise indicated.
   3. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating for NPS 2-1/2 and larger.
   4. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
   5. Screen: Stainless steel with round perforations, unless otherwise indicated.
   6. Drain: Pipe plug.

2.11 HOSE BIBBS

A. Hose Bibbs:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      b. Woodford Manufacturing Company.
      c. Zurn Plumbing Products Group; Specification Drainage Operation.
   2. Standard: ASME A112.18.1 for sediment faucets.
   3. Body Material: Bronze. Chrome plated in exposed public applications.
   4. Seat: Bronze, replaceable.
   5. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
   6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
   7. Pressure Rating: 125 psig.

8. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
9. Include operating key with each operating-key hose bibb.
10. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.12 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Woodford Manufacturing Company.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 (DN 20).
7. Outlet: With integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
9. Nozzle and Wall-Plate Finish: Rough bronze.
10. Operating Keys(s): Two with each wall hydrant.

2.13 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AMTROL, Inc.
   b. Josam Company.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows. Piston type will not be acceptable.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.14 CROSS LINKED POLYETHYLENE PIPING (PEX)

A. Type “A” manufacturing process:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Uponor, Inc.
   b. Rehau, Inc.
2. Standard: ASTM F1960 – Cold expansion joint fittings.
3. Galvanized channel pipe support system with stainless steel straps

PART 3 - EXECUTION

3.01 PIPING SCHEDULE

A. Under-building-slab, domestic water, building service piping, NPS 4 and smaller, shall be the following:
1. Soft copper tube, ASTM B 88, Type K; wrought-copper solder-joint fittings; and brazed joints.

B. Aboveground domestic water piping, all sizes, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; wrought- copper solder-joint fittings; and soldered joints.

C. Aboveground domestic water piping, 3” and smaller, downstream of water service entrance backflow preventer; Type “A” cross-linked polyethylene (PEX) with cold expansion joint fittings in compliance with ASTM F 1960. NPS ½” and NPS ¾” shall be roll type. NPS 1” and larger shall be stick type. Piping shall be color coded for NPS 1” and smaller. All vertical floor penetrations, regardless of size, shall be stick type.

3.02 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:
   1. NPS 1-1/2 and Smaller: Fitting-type coupling.
   2. NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.03 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.04 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to all fixtures and equipment in domestic water system.

3.05 PEX PIPING INSTALLATION

A. Utilize only manufacturers’ tools approved to make cold expansion joints.

B. Install galvanized support channels with stainless steel straps from same manufacturer of piping on all horizontal stick piping to maintain permissible copper pipe hanger spacing.

C. All fixture rough-ins shall be made with copper dog ear fittings and NOT roughed-in with PEX.

D. Piping from Shower valves to shower head shall be made with Type ‘L’ copper and NOT PEX.

E. Multi-port tees are permissable within resident rooms in lieu of tees and elbows.

F. Utilize manufacturer’s bend supports on roll PEX installed inside walls to facilitate 90-degree rigid bends on piping ¾” and smaller.

3.06 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:
   1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
   2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified in presence of authorities having jurisdiction:
      a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
      b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
   3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

3.07 CLEANING

A. Clean and disinfect potable domestic water piping as follows:
   1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
   2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill and isolate system according to either of the following:
         1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
         2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
      c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
      d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

D. Provide Bacteriological Test Report prepared by a Certified Water Testing Laboratory.

3.08 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved by designer.

B. Install water-pressure-reducing valves downstream from shutoff valves.

C. Install domestic water piping level and plumb.

D. Install unions in copper tubing at final connection to each piece of equipment.

E. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
   1. Locate backflow preventers where indicated on drawings.
   2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
   3. Do not install bypass piping around backflow preventers.

F. Install water regulators with inlet and outlet shutoff valves and full size valved by-pass. Install pressure gages on inlet and outlet sides where indicated on drawing.

G. Install dry-case-type pressure gauges for discharge of each pressure-reducing valve.

H. Install direct-mounting pressure gauges in piping tees with pressure gauge located on pipe at most readable position.

I. Install needle-valve and snubber fitting in piping for each pressure gauge.

J. Install test plugs in tees in piping.

K. Adjust faces of thermometers and gauges to proper angle for best visibility.

L. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve.

M. Install water hammer arresters in all areas where indicated on plans including locations with solenoid valves, flush valves, and washer boxes in accordance with PDI-WH 201.

N. Install air vents at high points of water piping.

3.09 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

3.10 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:
   1. Test each reduced pressure backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest.

3.11 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

END OF SECTION

SECTION 22 05 30

DRAINAGE, WASTE, VENT PIPING AND APPURTENANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following for soil, waste, and vent piping, chemical resistant waste and vent piping and condensate drainage piping inside the building.

1.03 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
   1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.04 SUBMITTALS

A. Product Data: For pipe, drains, cleanouts, and fittings listed herein.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.03 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
   1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
      a. Available Manufacturers:
         1) ANACO.
         2) Fernco, Inc.
         3) Tyler Pipe; Soil Pipe Div.

2.04 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
   1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns, Schedule 40.

2.05 CLEANOUTS

A. Exposed Metal Cleanouts:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Josam Company; Josam Div.
      b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      c. Zurn Plumbing Products Group; Specification Drainage Operation.
   2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
   3. Size: Same as connected drainage piping
   4. Body Material: as required to match connected piping.
   5. Closure: Countersunk, brass plug.
   6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
   7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Josam Company; Josam Div.
      b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      c. Zurn Plumbing Products Group; Specification Drainage Operation.
   2. Standard: ASME A112.36.2M for adjustable housing cleanout.
   3. Size: Same as connected branch.
   4. Type: Adjustable housing.
   5. Body or Ferrule: Cast iron.
   6. Outlet Connection: Inside calk.
   7. Closure: Brass plug with straight threads and gasket.
   8. Adjustable Housing Material: Cast iron with threads set-screws or other device.
   9. Frame and Cover Material and Finish: Nickel-bronze.
   10. Frame and Cover Shape: [Round] [Square] <Insert shape>.
   11. Top Loading Classification: Heavy Duty.
   12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
   13. Standard: ASME A112.3.1.
   14. Size: Same as connected branch.
   15. Housing: Stainless steel.
   16. Closure: Stainless steel with seal.
   17. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Josam Company; Josam Div.
      b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      c. Zurn Plumbing Products Group; Specification Drainage Operation.
   2. Standard: ASME A112.36.2M. Include wall access.
   3. Size: Same as connected drainage piping.
   4. Body: as required to match connected piping.
   5. Closure: Countersunk, brass plug.
   6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
   7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
   8. Wall Access: Round, nickel-bronze, wall-installation frame and cover.

2.06 FLOOR DRAINS

A. Cast-Iron Floor Drains:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company; Josam Div.
b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
c. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Body Material: Gray iron.
4. Outlet: Bottom.
5. Backwater Valve: Not required.
6. Top or Strainer Material: Nickel bronze.
7. Top of Body and Strainer Finish: Nickel bronze.
8. Top Loading Classification: As specified on plans.

2.07 AIR-ADMITTANCE VALVES

A. Fixture Air-Admittance Valves:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
a. Oatey.
b. RectorSeal.
c. Studor, Inc.
2. Standard: ASSE 1051, Type A for single fixture or Type B for branch piping.
3. Housing: Plastic.
4. Operation: Mechanical sealing diaphragm.
5. Size: Same as connected fixture or branch vent piping.

2.08 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Acorn Engineering Company; Elmdor/Stoneman Div.
b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.09 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:
1. General Applications: 12 oz./sq. ft..
2. Vent Pipe Flashing: 8 oz./sq. ft..

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.10 OIL INTERCEPTORS

A. Oil Interceptors:
   1. Refer to details and specifications on drawings.

2.11 ELEVATOR SUMP PUMPS

A. Submersible elevator sump pump in elevator pit sump:
   1. Available Manufacturers:
      a. Weil Pump.
      b. Grundfos Pumps Corporation.
      c. Zoeller Company.
      d. Liberty
   2. Stainless steel shaft.
   3. Bronze impeller.
   4. Mechanical seals.
   5. Mercury type float switch.
   6. Fractional horsepower (1/3 – 1/2), 115 volt, single phase, with 3 prong ground.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS AND VENT

A. Aboveground, soil and waste piping shall be the following:
   1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints for all exposed piping in parking garage.
   2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints in all other locations.

B. Underground, soil, waste, and vent piping shall be the following:
   1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

C. Aboveground, condensate piping all sizes shall be the following:
   1. Solid-wall PVC pipe, PVC socket fittings and solvent-cemented joints.

D. Underground, condensate piping all sizes shall be the following:
   1. Solid-wall PVC pipe, PVC socket fittings and solvent-cemented joints.

3.02 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install seismic restraints on piping per local building codes.

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

E. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.

F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and

reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
   1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 2 and smaller; 1 percent downward in direction of flow for piping NPS 3 and larger.
   2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

I. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

J. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

K. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

L. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

M. PVC piping will not be permitted in return air plenums.

3.03 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

C. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.04 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to all plumbing fixtures and drains.

3.05 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.06 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.07 INSTALLATION OF APPURTENANCES

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
   1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
   4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Cleanout Types:
   1. Exterior: Cast iron cutoff ferrule with round scoriated frame and cover, secured.
   2. Finished Concrete Floors: Neolock Connection, with round Nikaloy scoriated frame and cover.
   3. Ceramic Tile Floors: Neolock Connection, with round Nikaloy scoriated frame and cover.
   4. Resilient Tile Floors: Neolock Connection, with round recessed Nikaloy smooth round frame and cover.
   5. Wall: Smooth round stainless steel access cover with securing screw.
   6. Carpet Floor: Neolock Connection with round Nikaloy scoriated frame and cover with carpet marker.
   7. Note: Use clamping device on cleanouts than occur in floors having waterproof membrane.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
   1. Position floor drains for easy access and maintenance.
   2. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
   3. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
   4. Where square grates are utilized, align with adjacent floor tiles.

F. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Install deep-seal traps on floor drains.

I. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

J. Install oil interceptors, including trapping and venting according to authorities having jurisdiction and with clear space for servicing.

K. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

L. Install check valve and ball valve in elevator sump pump discharge line.

M. Refer to plumbing drawings for elevator sump pump discharge location.

3.08 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.09 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 05 35

FACILITY STORM DRAINAGE PIPING AND APPURTENANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following storm drainage piping inside the building:
   1. Pipe, tube, and fittings.
   2. Special pipe fittings.
   3. Encasement for underground metal piping.

1.03 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:
   1. Storm Drainage Piping: 10-foot head of water.

B. Seismic Performance: Storm drainage piping and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.04 SUBMITTALS

A. Product Data: For pipe, drains and fittings.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.03 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
   1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
      a. Available Manufacturers:
         1) Fernco, Inc.
         2) Mission Rubber Co.
         3) Tyler Pipe; Soil Pipe Div.

2.04 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. PVC piping not permitted in return air plenums.

2.05 CLEANOUTS

A. Exposed Metal Cleanouts:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
      a. Josam Company; Josam Div.
      b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      c. Zurn Plumbing Products Group; Specification Drainage Operation.
   2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
   3. Size: Same as connected drainage piping
   4. Body Material: as required to match connected piping.
   5. Closure: Countersunk, brass plug.
   6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
   7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
      a. Josam Company; Josam Div.
      b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      c. Zurn Plumbing Products Group; Specification Drainage Operation.
   2. Standard: ASME A112.36.2M for adjustable housing cleanout.
   3. Size: Same as connected branch.
   4. Type: Adjustable housing.
   5. Body or Ferrule: Cast iron.
   6. Outlet Connection: Inside caulk.
   7. Closure: Brass plug with straight threads and gasket.
   8. Adjustable Housing Material: Cast iron with.
   9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
   10. Frame and Cover Shape: Round.
   11. Top Loading Classification: Heavy Duty.
   12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
   13. Standard: ASME A112.3.1.
   14. Size: Same as connected branch.
   15. Housing: Stainless steel.
   16. Closure: Stainless steel with seal.
   17. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Josam Company; Josam Div.
      b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      c. Zurn Plumbing Products Group; Specification Drainage Operation.
   2. Standard: ASME A112.36.2M. Include wall access.
   3. Size: Same as connected drainage piping.
   4. Body: as required to match connected piping.
   5. Closure: Countersunk, brass plug.
   6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
   7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
   8. Wall Access: Round, nickel-bronze, wall-installation frame and cover.

2.06 ROOF DRAINS

A. Metal Roof Drains/Secondary Roof Drains:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
      a. Josam Company; Josam Div.
      b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      c. Zurn Plumbing Products Group; Specification Drainage Operation.
   2. Standard: ASME A112.21.2M.
   3. Pattern: Roof drain.
   4. Body Material: Cast iron.
   5. Outlet: Bottom.
   6. Dome Material: Cast iron.
   7. Extension Collars: Required.
   8. Underdeck Clamp: Required.
   9. Sump Receiver: Required.
   10. 2” External or internal dam on secondary roof drains.

2.07 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, 12 oz./sq. ft. thickness.

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Aboveground storm drainage piping shall be the following:
   1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and coupled joints on all exposed piping within parking garage.
   2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints at all other locations.
   3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

B. Underground storm drainage piping shall be the following:
   1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

3.03 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers.

C. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

D. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

E. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:
   1. Building Storm Drain: 1 percent downward in direction of flow for all piping unless noted otherwise.

F. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

G. Install PVC storm drainage piping according to ASTM D 2665.

H. Install underground PVC storm drainage piping according to ASTM D 2321.

I. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

J. Secondary storm drainage piping system shall be of same materials as primary system.

3.04 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results Plumbing."

B. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.05 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains, secondary roof drains, and storm drainage specialties.

3.07 INSTALLATION OF APPURTENANCES

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping according to the following, unless otherwise indicated:
   1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
   4. Locate at base of each vertical rain water leader.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Cleanout Types:
   1. Exterior: Cast iron cutoff ferrule with round scoriated frame and cover, secured.
   2. Finished Concrete Floors: Neolock Connection, round Nikaloy scoriated frame and cover.
   3. Ceramic Tile Floors: Neolock Connection, with round Nikaloy scoriated frame and cover.
   4. Resilient Tile Floors: Neolock Connection, with round recessed Nikaloy smooth round frame and cover.
   5. Wall: Smooth round stainless steel access cover with securing screw.
   6. Carpet Floor: Neolock Connection with round Nikaloy scoriated frame and cover with carpet marker.
   7. Note: Use clamping device on cleanouts than occur in floors having waterproof membrane.

F. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
   1. Install roof-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
   2. Position roof drains for easy access and maintenance.

G. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

H. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

I. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

J. Base of all roof drains and overflow drains shall be insulated in accordance with Division 22, “Plumbing Insulation.

3.08 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
   1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
   2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
   1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
   2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
   3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Fabricate and install flashing and pans, sumps, and other drainage shape.

3.09 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

3.10 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

SECTION 22 05 40

ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following electric water heaters:
   1. Household, storage electric water heaters.
   2. Compression tanks.
   3. Water heater accessories.

1.03 SUBMITTALS

A. Product Data: For each type and size of water heater indicated herein. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Warranty: Special warranty specified in this Section.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer where multiple water heaters are utilized on project.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Where indicated by model specified, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.05 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including storage tank and supports.
      b. Faulty operation of controls.
      c. Deterioration of metals, metal finishes, and other materials beyond normal use.
   2. Warranty Period(s): From date of Substantial Completion:
      a. Compression Tanks: One year.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.02 HOUSEHOLD ELECTRIC WATER HEATERS

A. Household, Standard, Storage Electric Water Heaters: Comply with UL 174.
   1. Available Manufacturers:
      a. Bradford White Corporation.
      b. Lochinvar Corporation.
      c. Rheem Water Heater Div.; Rheem Manufacturing Company.
      d. Ruud Water Heater Div.; Rheem Manufacturing Company.
   2. Storage-Tank Construction: Steel.
      a. Tappings: ASME B1.20.1 pipe thread.
      b. Pressure Rating: 150 psig.
      c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
   3. Factory-Installed Storage-Tank Appurtenances:
      a. Anode Rod: Replaceable magnesium.
      b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
      c. Drain Valve: ASSE 1005.
      d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
      e. Jacket: Steel with enameled finish.
         1) Standard: Cylindrical shape.
      f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
      g. Heating Elements: Two; electric, screw-in immersion type with 12 kW or less total, and wired for nonsimultaneous operation, unless otherwise indicated.
      h. Temperature Control: Adjustable thermostat for each element.
      i. Safety Control: High-temperature-limit cutoff device or system.
      j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

2.03 COMPRESSION TANKS

A. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
   1. Available Manufacturers:
      a. AMTROL Inc.
      b. Armstrong Pumps, Inc.
      c. Wessels Co.
   2. Construction:
      a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
      b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
      c. Air-Charging Valve: Factory installed.

2.04 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

B. Water Heater Stands: Factory-fabricated steel stand for floor mounting and capable of supporting water heater and water.

C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4.

D. Where water heaters are not noted as being installed on stands, mounted on the wall, or mounted above ceiling, install water heater on a 4” thick dedicated reinforced concrete pad dowelled into concrete floor slab. Pad shall be minimum of 4” larger in all directions than installed water heater.

PART 3 - EXECUTION

3.01 WATER HEATER INSTALLATION

A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

B. Install seismic restraints as required for commercial water heaters. Anchor to substrate.

C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.

E. Fill water heaters with water - Before Energizing.

F. Charge compression tanks with air.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Connect wiring according to Section "Low-Voltage Electrical Power Conductors and Cables."

3.03 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections on all large commercial water heaters. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
   1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters.

END OF SECTION

SECTION 22 05 50

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For plumbing fixtures to include in operation, and maintenance manuals.

1.03 COORDINATION

A. Contractor shall examine Architectural drawings for exact location and number of plumbing fixtures required. Architect/Engineer shall be notified of any discrepancies between the architectural and plumbing drawings prior to bidding. Failure to examine all drawings will not constitute a change order for fixtures to be added which were shown on one but not the other.

B. Refer to Architectural plans for rough-in dimensions. Do not scale plumbing drawings for rough-in dimensions.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

PART 2 - PRODUCTS

2.01 PLUMBING FIXTURES

A. Specific manufacturers and model numbers of all plumbing fixtures and trim required for this project are indicated in the plumbing fixture schedule on the plumbing drawings. Items specified indicate the quality and appearance required.

B. China or enamel fixtures shall be white in color unless noted otherwise.

C. All fixtures designed for handicap use shall be mounted at handicap height per local enforced handicap code.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
   a. All China and Enameled cast iron fixtures: Kohler, American Standard, Toto USA, Zurn
   b. Lavatory and Sink Faucets: Zurn, Kohler, T and S Brass, Chicago Faucet, Moen
   c. Shower Valves/Heads: Symmons, Powers, Leonard, Delta, Kohler.
   d. Flush Valves: Zurn, Sloan, Toto USA, Delany
   e. Toilet Seats: Centoco, Church, Bemis
   f. Drop-in Stainless Steel Sinks: Elkay, Just, Advance Tabco, Kohler
   g. One-piece Showers / Tubs: Aquarius, Lasco, Comfort Design, Aqua Bath, Kohler
   h. Drinking Fountains/Water Coolers: Elkay, Halsey Taylor, Haws, Oasis
   i. Service Sinks and Basins: Stern Williams, Zurn, Kohler, American Standard
   j. Laundry Sinks: Fiat, Florestone, Mustee, Zurn, Kohler
   k. Traps/Supplies/Stops: Zurn, McGuire
   l. Wrap Kits: Trubro, Brocar, McGuire, Zurn

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
   1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
   2. Use carrier supports without waste fitting for fixtures with tubular waste piping.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Utilize floor mounted carriers with extended arm supports for support of wall mounted china and enameled cast iron lavatories.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

L. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

M. Install toilet seats on water closets.

N. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install shower flow-control fittings with specified maximum flow rates in shower arms.

P. Install traps on fixture outlets.
   1. Exception: Omit trap on fixtures with integral traps.
   2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

Q. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

R. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

S. Coordinate installation of all counter mounted sinks and lavatories with casework manufacturer's shop drawings prior to installation. Install offset tailpieces where required to maintain required clearance for angled aprons. Locate sink or lavatory in casework as required to avoid conflict with counter apron.

3.03 HANDICAP PLUMBING FIXTURE MOUNTING REQUIREMENTS

A. Plumbing fixtures designated for handicap usage shall be mounted at handicap height in accordance with I.C.C A117.1 - 2009 Accessibility Code.

B. Adult fixture mounting Heights as follows: Dimensions listed are above finished floor:
   1. Water closets: Top of seat 17"-19", manual flush valve handle 44" max. on wide side of stall.
      a. Tank water closets shall have tank flushing mechanism on side of tank representing the wide side of the stall.
   2. Urinals: Top of extended lip max. of 17", manual flush valve handle 44" max.
   3. Lavatories: Top of lavatory bowl max. of 34" while maintaining 27" min. vertical clearance below lav and max. 6" deep x 9" vertical min. toe clearance.
   4. Electric water coolers / drinking fountains: 36" max. to spout outlet while maintaining 27" min. vertical clearance below the leading edge and 6" max. depth x 9" min. vertical space for toe clearance.

3.04 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. See schedule on plans for connection sizes to fixtures.

D. Connect wall-hung urinals to waste piping with red brass nipples.

E. Each fixture, floor drain, and piece of equipment requiring connection to drainage system to have separate traps installed as close to fixture as possible.

3.05 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.06 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

D. Install fresh batteries in sensor-operated mechanisms.

3.07 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
   1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
   2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.08 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 05 00

GENERAL PROVISIONS - HVAC

PART 1 GENERAL

1.01 WORK INCLUDED

A. It shall be the contractor's responsibility to furnish and install complete all systems, equipment, and related items described under Division 23.

B. It shall be the Contractor's responsibility to determine the characteristics of electrical currents available to operate the mechanical equipment prior to ordering such equipment. All electrically operated equipment shall be designed for operation with the type of electric current available to the project.

C. It shall further be the Contractor's responsibility to locate, layout and make provisions for all openings required in precast or cast in place concrete slabs, etc., necessary to accommodate his work.

D. Do all excavation and backfilling required for the installation of piping and other mechanical work underground. This work shall comply with all applicable provisions of "Excavating and Backfilling" and Division 31, EARTHWORK.

E. Provide labor, materials, tools, and services for a complete installation of equipment and systems specified herein and indicated on drawings.

F. All equipment shall be installed in accordance with the manufacturer's drawings and recommendations.

G. The Contractor shall furnish and install all rough-in work and make final connections to all equipment requiring exhaust systems, ductwork and other mechanical work required for connection to equipment furnished under this contract.

H. The equipment shall be properly prepared structurally and mechanically ready to receive a single connection for each of the various mechanical items with all ductwork, etc., internal to and part of the equipment installed by the equipment manufacturer or supplier.

I. Verify all connections and rough-in locations with the Architect and / or the equipment supplier or contractor prior to the start of their work.

J. Contractor agrees to assume responsibility for liability, workmanship and quality of materials concerning work sublet to others. Before part of contract is sublet, submit to Architect in writing names of proposed subcontractors and obtain written approval.

K. Related Documents: General conditions, Supplemental General Conditions, and General Requirements are part of this division.

1.02 CODES AND FEES

A. All work shall be installed in accordance with the applicable provisions of the local codes, latest adopted International Mechanical Code, NFPA, UL, ASTM, ASHRAE, SMACNA, ASME and ANSI.

B. The Contractor shall pay for fees and inspections as may be required for systems requiring inspection by agencies having jurisdiction.

1.03 ELECTRICAL WORK

A. All control wiring and conduit not shown on Electrical drawings shall be furnished and installed under Division 23 according to the National Electrical Code and Division 26 requirements. See G.2.

B. All power wiring and conduit for items furnished under Division 23 shall be furnished and installed under Division 26. See G.1.

C. All disconnects shall be furnished and installed by Division 26.

D. Toggle switches for 1/2 HP motors and less shall be furnished and installed by Division 26.

E. Wiring and conduit for solenoid valves, and control transformers including the transformers shall be furnished and installed by Division 23.

F. Division 26 shall install all starters, toggle switches, disconnects, and all wiring to the respective motor or device. Wiring and conduit from starter to a controller shall be by Division 23.

G. Definitions
   1. Power wiring: Line voltage circuitry rough-in including conduit, boxes, conductors, etc. between the overcurrent protection and the equipment including the connection of the starters.
   2. Control wiring: Any voltage circuitry rough-in including conduit, boxes, conductors, etc. between control activator and the controller or starter.

H. Conduit: All power wiring and 120V control wiring shall be in conduit. Low voltage control wiring shall be installed in conduit where exposed, or in return air plenums, in masonry walls, or below slab.

I. Smoke Detectors and Firestats
   1. Smoke detectors shall be furnished and installed by Division 23 unless the project has a fire alarm system, then smoke detectors shall be furnished by Division 26, installed in ductwork by Division 23. All wiring and conduit from detector to fan shall be considered control wiring. 110 Volt wiring to the detector shall be power wiring. Wiring from the detector to fire alarm system shall be furnished and installed by Division 26.
   2. All firestats shall be furnished, installed, and wired by Division 23.

1.04 RECORD DRAWINGS

A. The Contractor shall maintain a set of prints that reflect site conditions including location of valves, dampers, underground piping, ductwork, equipment, etc. that have been changed to suit job conditions. The contractor shall prepare a corrected reproducible tracing of the project using the results of the record print. Final payment shall not be made until such document(s) is turned over to the architect upon completion of the project.

1.05 QUALITY ASSURANCE

A. Perform work of this section using skilled workers who are trained and experienced in the required crafts and who are knowledgeable and familiar with the specified requirements and the methods to be used for proper performance of the work.

1.06 COMPLETE WORK

A. Contractor shall provide and install all systems in complete working order. All items normally required for operation shall be provided.

PART 2 PRODUCTS

2.01 IDENTIFICATION

A. All pipe lines installed under the contract shall be clearly labeled to indicate their function and flow direction. Labels shall be applied by stencil, decal, printed tape, or equivalent method, and shall be so spaced that the lines may be traced from start to finish. Labels (where used) shall be Seton "Setmark" or approved substitute.

B. Round brass tags shall be provided to identify the function of each valve in the various piping systems, except valves for which the purpose is self-evident. Tags shall be approximately 1½" in diameter, properly stamped and securely fastened to the valve. A valve tag list showing valve tag number, and valve type and function shall be framed under clear plastic glazing and placed in main mechanical room.

C. All starters and pushbutton stations shall be labeled to identify the equipment which they control, utilizing Kroy Duratype 240 SE industrial tape, and suitable labeling machine or approved substitute.

D. All air units, fans, etc., shall be labeled with drawing mark number and with description of area served, utilizing engraved plastic laminate nameplates. Nameplates shall be Seton “Setonply” or approved substitute.

E. All air unit thermostats shall be labeled with proper mark number identifying it with air unit it serves, utilizing Kroy Duratype.240 SE industrial tape, and suitable labeling machine or approved substitute.

2.02 INDOOR ENVIRONMENTAL QUALITY - LOW EMITTING MATERIALS

A. All adhesvise and sealants used on the interior of the building (inside the weatherproofing and applied on-site) shall comply with "South Coast Air Quality Management District 9SCAQMD) Rule #1168", current VOC limits.

B. Paints and coatings used on the interior of the building shall comply with the following criteria for VOC limits:
   1. Architectural paints, coatings and primers - Green Seal Standard GS-11, Paints, 1st Edition 5/20/93.
   2. Anti-corrosive and anti-rust paints - 250 g/l per Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.

2.03 SERVICE AND MAINTENANCE CONTRACT

A. The Contractor shall make arrangements with an independent service and maintenance contractor, "**other than the project mechanical contractor**" and as approved by the Architect, to perform all the required servicing and maintenance of the heating, ventilating and air conditioning system, without cost to the owner, for a period of one year after date of substantial completion. The name of the service contractor shall be part of submittals.

B. The servicing shall be complete in every respect and shall include but not be limited to the following: Replacing or washing of all filters as required for proper equipment operation, replacing bad belts, compressors, bearings, motors, controls, electric heaters, refrigerant specialties, couplings; cleaning drain pans and piping; replacing refrigerant and oil, bearing lubrication, and keeping equipment reasonably clean.

C. This service work shall be performed a minimum of three times a year. Filters may need changing more than 3 times depending on conditions. A written report shall be submitted to the Owner describing each visit. The date the service work starts shall be clearly identified in close out documents.

2.04 EQUIPMENT LIST, SHOP DRAWINGS AND SAMPLES

A. Submit to the Architect for approval, within 30 days after receipt of Notice to Proceed with the work, detailed shop drawings of all equipment and all material required to complete the project. The shop drawing shall be complete as described herein. The Contractor shall furnish the number of copies required by the General and Special Conditions of the Contract, but in no case less than six (6) copies.

B. **All shop drawings to be submitted at one time in a 3-ring binder with cover and drawing index sheet.**

C. The shop drawings shall be detailed, with dimensioned drawings or catalog cuts, showing construction, size, arrangement, operating clearances, performance characteristics and capacity. Each item of equipment proposed shall be a standard catalog product of an established manufacturer and of equivalent quality, finish, and durability to that specified. Submission material and all shop drawings for the various items of equipment shall be marked with the respective mark number or identification of the equipment shown on the drawing or in the specification.

D. Provide a cover sheet for all major equipment that shall list in detail all accessories called for in specifications and on drawings that are being supplied. Also, list operating capacities shown in schedules or described on drawings. Failure to list these items will result in resubmittal. A copy of a standard catalog will not be sufficient. Shop drawings for controls shall contain a detailed sequence of operation. Provide shop drawings for piping firestop details required in Division 230510.

E. Shop drawings shall show sizes and details of required concrete and steel machine foundation, location of anchor bolts, physical dimension of equipment, equipment weight or other pertinent data required for equipment support or installation.

F. The contractor shall verify all electrical requirements of equipment with the electrical service available before ordering said equipment.

G. Approved shop drawings do not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings or specifications.

2.05 TEST AND BALANCE OF AIR SYSTEMS

A. The Contractor shall make arrangements with an independent Balancing Agency to balance all air flow systems to the flow rates indicated on the Drawings. This shall include all air handling unit fans, supply fans and exhaust fans. The Balancing Agency shall be one normally engaged in such work. The agency shall be **AABC or NEBB certified**.

B. The contractor shall **submit a complete resume of the Balancing Agency for approval** by the Architect and Engineer. The resume shall contain examples of work, references, personnel available, and certifications.

C. The Balancing Agency shall prior to balancing inspect the work in place and prepare a report to the mechanical contractor with a copy to the Architect of work to be completed before balancing can start. Heating and cooling equipment shall be fully operational before balancing.

D. The Balancing Agency shall record the test results in tabulated formats for both cooling and heating conditions and submit two (2) copies to the Architect for approval. These results shall include, as a minimum, the following:

1. Test and record fan total CFM (design and actual)
2. Test and record fan outside air CFM (design & actual.)
3. Test and record fan suction static pressure and fan discharge static pressure (actual.)
4. Test and record static pressure on both sides of all filters and coils (actual.)
5. Test and record fan RPM (design and actual.)
6. Record fan sheave, motor sheave, pitch diameter after adjustment (if variable), center line to center line distance from fan shaft to motor shaft, belt size, and number of belts (actual.)
7. Change sheaves, pulleys, and belts, if required to obtain design air flow.
8. Test and record fan motor horsepower, amperage, voltage, and RPM (rated and actual.)
9. Record fan motor manufacturer, model and serial numbers and service factor (actual.)
10. Record motor starter size (actual.)
11. Test and record diffuser, register and grille CFM (preliminary, design and actual) for supply, return and exhaust systems. If the return air quantities are not shown at the return grille locations on the contract documents, use the percentage method (supply air less the outside air equals the percentage of return air) and balance the return air grilles accordingly.
12. Test and record main duct traverse readings for all air handling units and fans (preliminary, design and actual.) This shall include exhaust, supply, return and outside air ducts.
13. Record each system supply air temperature, return air temperature mixed air temperature and outside air temperature (dry bulb and wet bulb) in heating and cooling modes.
14. Record air temperature and humidity in each room at time of air balance.
15. Record AHU type, location, manufacturer, model number, and serial number.
16. Mark all damper quadrants as to final adjusted position, and lock into place.
17. Check fan rotation on all fan units.
18. Check filters for cleanliness prior to balancing. Test only with new, clean filters of the type specified in place.
19. In cooperation with the control manufacturer's representatives, set and adjust all automatically operated dampers to operate as specified.
20. Record the date, time, outside temperature and outside humidity at the time of recording unit temperatures.

E. Architect and engineer reserve the right to require the contractor to demonstrate the uniformity of heating and cooling in each area of the building.

F. All equipment, fans, motors, etc., shall run at their required speeds and be free from excessive vibration and noise. No bearings, journals, or any part of the motors shall heat to a temperature in excess of 40°C above the temperature of the surrounding air.

G. All air balancing shall be ±10% of design flows.

2.06 EQUIPMENT START-UP

A. Before final payment, provide architect and engineer with letter from each equipment supplier stating that equipment has been started and checked by factory qualified field service technicians and is installed and running satisfactory in every respect.

PART 3 EXECUTION

3.01 TESTS

A. Test all piping, following installation, but before it is covered or connected to the equipment. Furnish necessary labor, materials and equipment for making test. All leaks disclosed by testing shall be reworked in an approved manner and the leaking system shall then be retested until proved tight under pressure. Test all systems for watertightness (or gas-tightness) as required by the authorities having jurisdiction, or in the absence of such requirements the minimum tests shall be made as follows:

1. All refrigerant piping systems shall be tested at 200 pounds with dry nitrogen until all leaks have been made tight. After the pressure tests use suitable vacuum pump to evacuate the system to at least 1000 microns, then charge the system with refrigerant and oil as required. Prior to running the refrigerant equipment all safety and operating devices and controls shall be properly adjusted and tested for proper operation and protection of the equipment.

B. Test all heating, cooling and ventilating equipment. When installation is complete, all equipment shall be tested for proper operation and functioning as directed by Architect.

1. All equipment, motors, fans, etc., shall run at their required speed and be free from excessive vibration and noise. No bearings, journals, or any part of the motors shall heat to a temperature in excess of 40°C. above the temperature of the surrounding air.
2. The equipment, diffusers, registers, dampers, etc., shall be adjusted to deliver air at all outlets according to the amount of air shown on the drawings or as required to obtain adequate room temperature.
3. Architect reserves the right to require the Contractor to demonstrate the uniformity of heating and cooling in each area of the building.

3.02 COORDINATION

A. The mechanical work shall be installed as neatly as possible in the locations shown but shall be subject to such deviations, modifications and relocations as may be necessary to conform to the requirements of the architectural drawings and as necessary to avoid interferences with the structural work and the work of other trades, and interferences between the various trades. This shall be done at no cost to the Owner. No ductwork or equipment shall be installed which would require ceilings to be lower than required by drawings, unless approval is obtained from the Architect.

B. It is the responsibility of the General Contractor to coordinate the work of his subcontractors. To this end, the General Contractor shall require that the various subcontractors carefully examine and familiarize themselves with the architectural and structural drawings and drawings covering the work of other trades, and that they frequently consult with all other trades so that the work may be coordinated.

C. If necessary to coordinate and expedite the work, the Contractor shall prepare "interference drawings" and submit them to the Architect for approval. Such drawings shall show the work of the various trades involved, illustrate proposed details of construction and arrangement of equipment and apparatus, and clearly indicate any deviations from contract requirements.

D. Minor changes in arrangement may be made to suit unforeseen conditions, but no major deviation shall be made without written approval from the Architect. If any deviations are deemed necessary, submit all details of proposed changes and all reasons therefore, in writing, to the Architect for approval prior to making installation of such work.

E. Do not fabricate ductwork and piping before interferences are verified. No extra will be allowed for piping or ductwork fabricated in advance which cannot be used.

F. Field verify exact sizes of fire dampers and duct balancing dampers before ordering. No extra will be allowed for dampers ordered in advance which cannot be used.

3.03 EXCAVATING AND BACKFILLING

A. Do all excavating and backfilling required for the installation of underground work required by the mechanical work.

B. Excavating and backfilling shall comply with all applicable provisions of Division 31, EARTHWORK, including the provisions therein concerning classification of excavated material.

C. Copper piping and PVC piping, shall be laid on a 6" bed of sand and backfilled with 12" of sand in 6" layers to 12" above top of pipe in areas not below slab or pavement. Complete backfilling with Tennessee Highway Class "B" aggregate to slab under building and outside of building to underside of pavement. The balance of the fill outside the building shall be clean earth thoroughly tamped and crowned to allow for subsequent settlement. Compact to 100% density under buildings and paved areas.

D. All trenches shall be braced as required to protect workmen and adjacent work. Comply with local regulations or, in absence thereof, with provisions of the "Manual of Accident Prevention in Construction", of the AGC.

3.04 CUTTING AND REPAIRING

A. All chases, recesses, sleeves and other openings in masonry and concrete shall be built in as the construction work progresses, and it shall be the responsibility of the subcontractor to see that such chases, recesses, sleeves and other openings required for their work are properly located and installed. If this is not done by the subcontractor whose work required such accommodation, it shall be performed at his expense.

B. Structural members or finished work shall not be cut without the express permission of the Architect. Cutting shall be done neatly and patching or repairing shall match adjacent work.

3.05 PROTECTION AND CLEANING

A. Work shall be protected at all times. Pipe openings shall be closed with caps or plugs until permanent connections are made. Equipment shall be covered, if necessary, to protect against dirt, water, chemical or mechanical damage or defacement. The installation of fixtures liable to damage shall be deferred by the Architect. Cover all machine openings and open ends of ductwork to prevent entry of dirt and debris as project construction progresses.

B. Upon completion of the work and after all tests have been made and piping systems proven tight, clean all equipment, dirt pockets, water tanks, circulating systems, filters, etc., and leave in correct operating condition. No air unit shall be operated without filters.

3.06 PAINTING

A. Painting of mechanical equipment, piping, and exposed ductwork in finished spaces, or exposed on the exterior, shall be finished as specified under Section 099100, PAINTING. All equipment exposed on the exterior furnished without factory finish shall be painted.

B. Equipment with a factory applied finish shall have scratches, chips, etc., primed and touched up with materials which will protect the surface and match the adjacent area.

3.07 OPERATING INSTRUCTIONS

A. Furnish the services of competent personnel to instruct the Owner's personnel in the proper operation and maintenance of all equipment, for a period of not less than 3 working days. All owner training sessions shall be videotaped and at the completion of training a DVD format copy of the video shall be given to the owner with all installation, operation, and maintenance manuals.

B. Furnish and deliver to the Owner three sets of operating instructions for all equipment installed under this contract, including shop drawings, piping diagrams, wiring diagrams, maintenance recommendations and information concerning replacement parts. This information must contain mechanical and plumbing contractor names, equipment supplier names, contact personnel, telephone numbers, and facsimile telephone numbers. This information shall be contained in a three ring binder of suitable size, and labeled on the exterior with project name.

3.08 QUIETNESS OF OPERATION

A. All fans, motors and other apparatus shall be selected and installed for reasonably quiet operation. Any objectionable noise which develops shall be corrected before the work will be accepted. Equipment or duct connections and fittings which produces objectionable noise shall be adjusted or insulated so as to eliminate the noise, or shall be removed and replaced by satisfactory equipment. Provide spring or rubber machine mounting isolators and flexible piping and duct connections where necessary to prevent transmission of vibration to building structure or to piping and duct system.

3.09 GUARANTEE

A. The Contractor shall guarantee all work to be in accordance with contract requirements and free from defective or inferior materials, equipment, and workmanship for a period of one year, and he shall guarantee that all equipment is of proper size and design and so installed as to produce the capacities and results specified and shown on the drawings. Compressors shall have an extended 4 year warranty.

3.10 SUBSTITUTIONS

A. Substitutions shall be allowed in accordance with Division 1. Substitution approval shall be at the sole discretion of the Engineer.

B. Contractor shall note on shop drawings all major differences from specified material or equipment.

C. The contractor shall be responsible to verify that all dimensions, weights, and electrical requirement of substituted materials and equipment meet project requirements.

D. All requests for substitution must be submitted to the architect and engineer a minimum of 14 calendar days prior to project bid date. Such submission does not constitute approval. Only items or manufacturers specifically stated in the project specifications, drawings or addenda for use shall be considered as approved.

END OF SECTION

SECTION 23 05 10

BASIC MATERIALS AND METHODS - HVAC

PART 1 GENERAL

1.01 WORK INCLUDED

A. General provisions of Division 23, General and Supplementary Conditions, and General Requirements of Division 1, apply to this section.

1.02 BASIC REQUIREMENTS

A. Equipment and materials used in the work shall be in accordance with the contract documents, of the best quality and grade for use intended, shall be new and unused and shall be the manufacturer's latest standard or current model for which replacement parts are readily available.

B. Work shall be installed under the constant supervision of a competent superintendent and by skilled and competent mechanics experienced in the trade that contractor is practicing.

C. All apparatus and equipment shall be installed and connected in accordance with the best engineering practices and in accordance with the manufacturer's recommendations. All auxiliary piping, valves, electrical connections, etc., recommended by the manufacturer or required for proper operation shall be furnished and installed complete.

D. The work of this section is subject to the requirements of the Mechanical General Provisions and the General Requirements in Division 1.

PART 2 PRODUCTS

2.01 SLEEVES AND PLATES

A. All pipes that pass through masonry partitions and walls and concrete floor slabs shall be installed with standard weight galvanized steel sleeves. Sleeves through floors shall be long enough to project a minimum of 2" above finished floor. Sleeves shall be large enough for pipe, pipe insulation and required fire caulking. Sleeves in concrete shall be accurately located in the forms and secured in place to prevent displacement during pouring of concrete. Sleeves below grade in exterior walls shall be Link-Seal with wall penetration seal or approved substitution.

B. Sleeves in finished spaces shall finish flush with the finished wall surface. Sleeves for insulated water or refrigerant pipe shall be large enough to accommodate the insulation.

C. Pipes passing through masonry walls and partitions in finished spaces shall be fitted with metal escutcheons or collar plates. Plates occurring in painted walls or ceiling shall be prime coated for painting; other plates shall be chromium plated.

D. Exposed ducts passing through finished walls shall be furnished with sheet metal escutcheons.

E. All pipe penetrations of fire rated floors or walls are to be protected. Space between metal pipe and wall or sleeve shall be protected with Hilti Fire Barrier Penetration Sealing System or approved substitute. Installation shall be in accordance with the manufacturers recommendations for the hourly fire rating of the partition. The system shall be U.L. listed. For insulated chilled water, domestic cold water and refrigerant pipe, continue insulation and vapor barrier through wall. The sleeve through the wall shall be large enough for the pipe, insulation and fire caulking.

F. PVC pipe passing through rated walls, ceilings or floors shall have Hilti UL Listed Fire Protection System or approved substitute. System number shall be as required by construction and rating.

2.02 ACCESS PANELS

A. Furnish steel access panels, not smaller than 12" for single valve and 12" X 24" or 18" X 18" for two or more valves, for access of concealed valves, unions, dampers, etc., where no other means of access is shown or specified. Access panels shall be turned over to the general contractor for installation.

B. Panels shall be Milcor, or approved substitute, with screw driver operated cam latch, and of proper design and style for installation in wall, floor or ceiling construction called for on

architectural drawings. Access panels in fire rated construction shall have a UL label Class B rating. All panel styles to be verified by the Designer.

2.03 MOTORS

A. Motors shall be in accordance with AIEE, UL, and NEMA standards selected for quiet operation, of standard design for specific voltage available, and for continuous duty 40°C. rise. Unless otherwise specified, they shall be open drip proof, ball bearing, squirrel cage type, equal to Louis Allis, Westinghouse, G. E., or approved substitute. Provide raceway terminal box on each motor, of ample size and with removable cover for connections.

B. Motors up to and including l/2 HP shall be designed for 120 volts, single-phase current; motors 3/4 HP and larger shall be designed for 3-phase current. Voltage will be as called for on the drawings. Verify characteristics of available current at the building before equipment is ordered. Verify with electric drawings.

C. Horsepower for all motors shall be such that when drive apparatus is operated at full capacity, motor shall be under not less than 3/4 load nor more than full rating.

D. Each motor shall have a permanent name plate, showing name of manufacturer model and serial numbers, amperes per phase, horsepower, voltage, speed and cycles.

E. Provide for each belt drive motor a guard shielding perimeter and face of the drive.

2.04 MOTOR CONTROLS

A. All motors shall be furnished with starters under Division 23.

B. Manual starters with overload protection shall be used to control motors 1/2 HP and smaller. Single phase motors requiring interlock and all 3-phase motors shall be provided with magnetic starters.

C. Magnetic starters shall have thermal overload and low voltage protection. Three phase starters shall have (3) thermal overloads. Also, provide ground fault protection. All electrical and mechanical components shall be of the highest quality, and parts subject to wear or deterioration shall be renewable. Starters for motors 3/4 HP and larger shall be combination fused type and incorporate type L.P.S. fuses. Holding coils shall suit the requirements of control diagrams. Provide control voltage transformers in starters as indicated on control diagrams. Starters to be UL listed.

PART 3 EXECUTION

3.01 GENERAL

A. Run exposed ducts and piping parallel to the principal parts of the building. Ducts and piping shall be run concealed when provisions are made in floors, walls, ceilings and chases through all finished spaces, except where specifically noted otherwise.

B. Piping, ducts, and equipment shall be kept as close as possible to ceilings, walls, columns, etc., and shall be installed in such an orderly manner as to take up a minimum of space and allow a maximum of headroom, and all offsets, fittings, etc., required to accomplish this shall be furnished and installed, whether or not each offset and fitting is specifically shown or noted. Minimum clearances on exposed piping shall be maintained as specified under "Piping Clearances" herein.

END OF SECTION

SECTION 23 05 29
SUPPORTS AND ANCHORS - HVAC

PART 1 GENERAL

1.01 WORK DESCRIPTION

A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

B. Support (1) from wood using coach screws on open construction and hanger flanges on sheeting, (2) from concrete using inserts, (3) from steel using beam clamps, rivets or bolts, (4) from concrete blocks using toggle or through bolts. Fasten supports to building in following order of preference: (1) steel framing, (2) concrete, (3) wood framing, (4) masonry, (5) wood sheathing. Do not support from roof deck without approval. Do not use plastic wall anchors. All hangers, rods, and inserts shall be Underwriters Laboratories approved for the service intended and shall meet MSS #SP-58 & 69.

C. Adhesives are not acceptable as mounting or supporting devices.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. General Provisions, Section 230500.

B. Basic Materials and Methods, Section 230510.

PART 2 PRODUCTS

2.01 HANGERS

A. Use adjustable swivel ring band type for pipe 2½" and smaller, except C.I.. For pipe 3" and larger, unless otherwise noted, use adjustable steel, clevis type.

B. At each hanger on insulated pipe provide (1) pipe covering protection saddles on hot lines and (2) insulation shields on cold lines.

C. Saddles to be 16 gauge, minimum 12° saddles arc with the following minimum saddle lengths:

Pipe Size	Minimum Saddle Length
1	12"
2	12"
3	12"
4	12"
6	12"
8 & Greater	12"

D. Hanger surface material shall be such that there will be no possibility of electrolytic corrosion between hanger and pipe.

E. Anchors requiring explosive charges shall not be used. Phillips "Red-head" shields can be used for loads under 300 lbs.

2.02 BASES

A. On motor-driven equipment, where motor is not directly mounted on driven equipment, provide a structural steel base, reinforced to prevent flexure, which shall support both the equipment and the motor.

B. Provide bolts, inserts, pipe stands, brackets and accessories to distribute loads over building structure.

2.03 SLIDE BEARINGS

A. Slide bearings shall consist of 2 elements each made of 3/32" thick, 100% virgin tetrafluorethylene polymer and reinforcing aggregates prebonded to a steel backing. Principal aggregates material shall be ground glass fibers. Bonding material shall be heat-cured, high temperature epoxy capable of -320°F to +500°F temperatures. The coefficient of static friction of material to itself shall not exceed 0.902".

PART 3 EXECUTION

3.01 HORIZONTAL PIPING SUPPORT SCHEDULE

Pipe Size	Rod Dia.	Steel Max. Spac.	Copper Max. Spac.	PVC Max. Spac.
1) up to ½"	¼"	6ft.	4ft.	3½ ft.
2) 3/4" to 1"	3/8"	7ft.	5ft.	4ft.
3) 1¼"	3/8"	7ft.	7ft.	5ft.
4) 1½"	3/8"	8ft.	8ft.	5ft.
5) 2"	3/8"	10ft.	8ft.	5ft.
6) 2½"	½"	11ft.	9ft.	6ft.

3.02 METHOD

A. Provide hanger within 18" of each elbow, also provide hanger within 18" of connection to each piece of equipment.

B. Support vertical pipe at base and at each floor. In addition, 1" or smaller copper pipe shall be supported at 5 foot intervals.

C. Glass pipe hangers shall be padded.

D. Pipes passing thru walls shall not bear on building construction.

E. Where pipes carry material colder than 90°F, except domestic cold water, hangers shall be sized to fit outside diameter of insulation. Provide shields at each hanger. On 2½" and larger pipe, insulated with fiberglass, provide calcium silicate insulation at hangers.

F. All floor-mounted equipment shall be mounted on a reinforced concrete base covering the complete floor area of equipment. This concrete base shall be 4" high and shall extend 3" beyond the equipment on all sides. Provide all necessary anchor bolts and templates. Provide ¼" thick layer of non-shrinking grout between floor-mounted machinery and concrete pad. Where equipment mounts on structural steel, provide shims.

G. Any piece of equipment installed in a finished ceiling, or wall area, shall be supported independently of the building finish. Ceiling-mounted items shall be supported directly from the building structure except, with Engineer's written approval, can be from ceiling suspension system if the hanger load is less than 10 lbs.

H. Suspended equipment shall be supported from building structure by adjustable rods.

END OF SECTION

SECTION 23 07 00

INSULATION - HVAC

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. General provisions of the Contract, General and Supplementary Conditions, and General Requirements, apply to this section.

1.02 WORK INCLUDED

A. Work required under this section consists of insulation for piping and duct systems and equipment as hereinafter specified.

B. The work of this section is subject to the requirements of the Mechanical General Provisions and Basic Material Specifications.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Refrigerant Piping, Section 232300

B. Air Distribution, Section 233000

1.04 BASIC REQUIREMENTS

A. All materials used for insulation of pipe and ducts and equipment covered in this section shall be UL listed. Fire hazard ratings shall be as follows:
   1. Flame spread of 25, and smoke development of 50 for all duct insulation and other insulation located in ceiling plenums or rooms utilized for return air plenums.
   2. Flame spread of 25 and smoke development of 200 for other pipe and equipment insulation.

B. Increase the insulation thickness of ½" on all piping outside the building insulation envelope and weatherproof with 0.016" thick aluminum jacket with aluminum fitting covers. This piping shall be protected with electric heat tape installed under the insulation.

C. All insulation and thicknesses are selected to meet the 2006 International Energy Conservation Code.

D. Install 0.016" thick aluminum jacket on all pipe insulation in mechanical rooms 7'-0" from finished floor.

PART 2 PRODUCTS

2.01 FLEXIBLE TUBULAR ELASTOMERIC

A. Provide fire-retardant closed-cell slip-on flexible type. Product must be guaranteed by manufacturer to have continuous operational temperature limit of not less than 180°F and a minimum "R" value of 3.57 at 75°F 50% RH. Provide insulation for the following:
   1. Refrigerant suction and hot gas bypass lines - ½" thick on lines 1" or less - 1" thick on lines larger than 1". Install a 0.016" thick aluminum jacket on insulation outside the building.

2.02 FIBERGLASS BLANKET FOR DUCTS

A. Provide 2" thick 3/4" lb. density fiberglass blanket insulation with FSK or FRK jacket installed “R” value of 5.6. Install according to manufacturer's recommendations. For ducts 30" wide and over support insulation on bottom of duct with rows of welded insulpins on 18" center. Lap jacket 2" at seams and vapor seal. Provide this insulation for the following:
   1. All supply air ducts. Supply ducts exposed in conditioned spaces do not require external insulation.
   2. Outside air ducts.
   3. Top of supply air diffusers.
   4. Return air ducts installed below building insulation shall <u>not</u> be insulated unless noted otherwise.
   5. Relief air ducts and grilles.
   6. Supply and return duct insulation in attic spaces above roof insulation shall be 3"- 3/4# density with installer “R” value of 8.3.

PART 3 EXECUTION

3.01 GENERAL

A. Install all insulation products in strict accordance with manufacturer's instructions.

B. All items requiring service such as strainers, balancing valves, etc., provide removable insulation caps of insulation equal in thickness to pipe covering.

C. Cover all joint, rips, tears, punctures, staples, insulpins or breaks in vapor barrier jacket with 4" wide woven glass fabric tape embedded in vapor barrier fire resistant mastic.

D. No insulation shall be cut where a hanger is located.

E. Flexible tubular elastomeric piping installation shall be as follows:

1. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unslit sections over the open ends of piping or tubing. All seams and butt joints shall be adhered and sealed using Armstrong 520 Adhesive. When using AP Armaflex SS only the butt joints shall be adhered using 520 Adhesive.
2. Insulation shall be pushed on the pipe, never pulled. Stretching of insulation may result in open seams and joints.
3. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp knives must be used.
4. On cold piping, insulation shall be adhered directly to the piping at the high end of the run using a one inch strip of 520 Adhesive on the ID of the insulation and on the pipe. All exposed end cuts of the insulation shall be coated with 520 Adhesive.
5. Sheet insulation shall be used on all pipes larger than 6" IPS. Insulation shall not be stretched around the pipe. On pipes larger than 12" IPS, adhere insulation directly to the pipe on the lower 1/3 of the pipe.
6. Seams shall be staggered when applying multiple layers of insulation.
7. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seams and mitered joints shall be adhered with 520 Adhesive. Screwed fittings shall be sleeved and adhered with a minimum one inch overlap onto the adjacent insulation.
8. Valves, flanges, strainers and Victaulic couplings shall be insulated using Armaflex donuts that shall then be covered with sheet or oversized tubular insulation.

END OF SECTION

SECTION 23 23 00
REFRIGERANT PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. The work required under this section of the specification include all work necessary for the complete installation of a refrigerant piping system.

B. The work of this section is subject to the requirements of the Mechanical General Provisions and Basic Materials Specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Ductless Split System Units, Section 238126.

PART 2 PRODUCTS

2.01 REFRIGERANT PIPING SYSTEM

A. The refrigerant piping shall be Type L copper with wrought copper fittings and high temperature solder joints, silfos, or approved substitute. The piping system shall include but not be limited to the following: liquid line solenoid valves, hot gas bypass and control where noted, charging valves sight glass with moisture indicator, liquid line strainer drier, flexible connectors where required. The piping shall be installed according to the diagrams furnished by the manufacturer's Engineer for approval prior to installation. The piping system shall be tested at 200 pounds with dry nitrogen until all leaks have been made tight. After the pressure test use suitable vacuum pump to evacuate the system to a least 1000 microns, then charge the system with refrigerant, all safety and operating devices and controls shall be properly adjusted and tested for proper operation and protection of the equipment.

PART 3 EXECUTION

3.01 Route all refrigerant piping between condensing units and evaporator coils by the most direct route possible in order to minimize refrigerant line length.

3.02 All refrigerant piping must be supported from the building structure and affixed to the structures.

3.03 Reasonable measures should be taken to insure that the installed refrigerant piping forms no traps for the system lubricating oil.

3.04 Refrigerant piping extending through the roof shall be sleeved, water proofed and flashed watertight.

3.05 Refrigerant piping underground shall be run in PVC piping sleeve. Seal openings between PVC sleeve. Seal openings between PVC sleeve and refrigerant piping with foam to form a weatherproof seal.

3.06 All refrigerant suction and hot gas lines shall be insulated with flexible tubular elastomeric insulation as required in section 230700 hereinbefore.

END OF SECTION

SECTION 23 30 00

AIR DISTRIBUTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. The work required under this section includes all work necessary for the complete installation of an air distribution system.

B. The work of this section is subject to the requirements of the Mechanical General Provisions and Basic Materials specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Basic Materials and Methods, Section 230510.

B. Insulation, Section 230700.

1.03 CERTIFIED RATINGS

A. All fans shall have AMCA certified ratings and be UL listed.

PART 2 PRODUCTS

2.01 FANS

A. Ceiling fans shall be direct drive centrifugal type with grille, insulated housing, wall switch, backdraft damper, and discharge duct to roof with roof jack.

2.02 DUCTWORK

A. Type
   1. All ductwork shall be sheet metal unless noted otherwise (26 ga. minimum.)
   2. Ductwork type as follows:
      a. Supply return and outside air duct on constant volume system to be low pressure.
      b. Exhaust duct to be low pressure.

B. Low Pressure Sheet Metal Ductwork:
   1. Sheet metal work, unless noted otherwise, shall be fabricated of Armco Zincgrip-Paintgrip galvanized steel where exposed to weather or to be painted. Sheet metal for concealed ductwork shall be fabricated of galvanized steel, and be "Bethcon", as manufactured by Bethlehem Steel Company, or "Softite", as manufactured by Wheeling or approved substitute.
   2. Ducts shall be sizes shown on the drawings, cross broken, rigidly braced, adequately supported and securely fastened in place. Fabricate and install ducts in accordance with latest SMACNA Duct manual details.
   3. Stainless steel shall be used for the food service hoods and ducts. Use Type 304 for food service areas.
   4. Duct connections 24" wide and larger to be made using the "Ductmate System" or approved substitute. The installation to be complete using angles, corners, cleats, gaskets, sealer, and bolts. Install according to Manufacturers instructions.

C. Leakage Testing of Installed System Acceptance Criteria:
   1. The installed duct system shall be tested to the designed operating pressure. This includes supply, return, and exhaust duct.
   2. The air leakage at the test pressure shall be measured by a calibrated orifice type of flow meter. Total allowable leakage of the system shall not exceed 2 % of the air handling design capacity of the system.
   3. Leakage concentrated at one point may result in objectionable noise even if the system passes the leakage rate criteria. This noise source must be corrected to the satisfaction of the engineer.

D. Joint Sealing:

1. All joints shall be sealed with an approved duct sealer specifically formulated for sealing the field joints in duct systems. Sealer for low pressure duct systems (<2"w.g.) Shall be Ductmate Proseal or Foster 32-17 water based sealants.
2. Flanged joints shall be sealed by neoprene rubber gaskets.

2.03 DUCT ACCESSORIES

A. Fire Dampers - All fire dampers shall be Type B, constructed and tested for compliance with the latest edition of UL Standard 555. All dampers shall bear the UL label. Each damper shall be suitable for use in either the horizontal or vertical position and must include an integral drive spring. Sleeves and collars shall be furnished with fire dampers. Dampers shall be designed so as not to restrict air flow. A suitable access door in duct shall be provided for resetting all fire dampers. Install all dampers in accordance with all manufacturer installation instructions.

B. Louvers - Louvers in outside walls shall be high performance, drainable blade weather louvers. Louver to have extruded aluminum construction with anodized finish, color by Architect and 4" frame thickness. Adjustable louvers to have vinyl blade gasket. Louvers to have 0.15" wg., pressure drop maximum at 900 fpm velocity through free area and no water carryover at designed air flow. All louvers to have aluminum bird screen and exterior frame. All louvers are stationary type unless noted on drawings, and shall have AMCA seal.

C. Combination Fire/Smoke Dampers - All combination fire/smoke dampers shall be constructed and tested for compliance with the latest editions of UL Standard 555 and 555S. All dampers shall bear the UL label. The 120 volt (or 24 volt - designer specify) electric (or pneumatic - designer specify) damper shall be rated to 350_ Fahrenheit, with blade seals of silicone rubber capable of withstanding 450_ Fahrenheit. Additionally, the damper must be factory supplied with an actuator and sleeve to comply with the requirements of UL 555 and UL 555S. Install all dampers in accordance with all manufacturer installation instructions. Provide a suitable access door in duct for resetting of damper.

D. Brick Vents:
1. Brick vents in exterior walls shall be fabricated of extruded aluminum, 4" deep, with 45_blades. Frame and blades shall be 0.125" thick. Brick vent color shall be as selected by the architect.

E. Manual Balancing Dampers:
1. Manual balancing dampers in rectangular ducts shall be American Warming. Dampers in duct runs and branches shall be Model VC-21. Dampers to be constructed of 16 ga galvanized steel, with vinyl seals for low leakage at shutoff. All dampers to be caulked with silicone between damper and duct, and have external adjustment marked Open-Closed. Dampers shall be furnished with controls when motor operated. Dampers to be opposed blade type if either side is 12" or larger. Dampers under 12" may be single blade type.
2. Manual Balancing Dampers in round ducts shall be American Warming Model VC-22 in sizes up to and including 10" and Model VC-23 in sizes 12" and larger. Dampers to be 16 ga galvanized steel. Provide EPT sponge seals for low leakage.
3. Dampers to have 1% leakage rate at 1" wg duct pressure in accordance with AMCA 500.
4. All dampers to be installed with 2" standoff bracket.

F. Flexible Duct:
1. Flexible connections from main to terminal supply diffusers may be used above accessible ceiling areas.
2. Flexible duct shall be UL listed Class 1 air duct connector and be Flexmaster type 4M or approved substitute, with 1-1/2", 3/4 pound density glass fiber with flame resistant vapor barrier, R=6.0. Maximum lengths not to exceed 6 feet. Provide air tight inner liner, wire helix, and reinforced metalized outer jacket.
3. Use adjustable steel strap clamps or flexible nylon wire ties when attaching flexible duct to sheet metal collars. Wrap duct and collar with 2" wide duct tape before attaching clamp.
4. System to be UL 181, SBCC, BOCA, NFPA 90A & 90E, and HUD approved.
5. Do not use flexible duct in return or exhaust systems.

G. Grilles, Registers, and Ceiling Outlets:
   1. All flat grilles and registers shall be as scheduled on drawings, or approved substitute, as scheduled on the drawings, with baked enamel finish; color as selected by Architect.
   2. Coordinate location with reflected ceiling plans.
   3. Provide square to round adaptors if required.
   4. All outlets and inlets to have sealing gaskets and volume control dampers. Provide frame suitable for wall or ceiling installation used. Verify with Architectural drawings.
   5. Diffusers in UL ceilings to be steel with radiation damper and insulation blanket.

H. Flexible Connectors:
   1. Provide flexible connectors between each air unit or fan and the duct distribution, on both the supply side and the return side.
   2. Connectors shall not exceed 10 inches in lengths.
   3. Connectors to be of an approved flame retardant fabric with a maximum flame spread of (25) and a maximum smoke development rating of (50).
   4. All connectors on supply duct to be insulated.

I. Branch Connections:
   1. Main Supply Branch: (See SMACNA Manual Figure 2-7, 2-8) use unvaned radius transition elbow with splitter damper when branch width is 36" or smaller, and vaned square throat transition elbow when branch width is larger than 36".
   2. Sub-Branch Supply: (See SMACNA Manual Figure 2-16) use straight tap with extractor, having manual control rod extended thru main branch side, when extractor weight is 50 lbs or less. For sub-branch sizes where extractor would be heavier than 50 lbs, use 45° or radius entry clinch lock collar. (See SMACNA Figure 2-8, and manual balancing dampers.)
   3. Sub-Branch Return: (See SMACNA Manual Figure 2-8) use 45° or radius entry clinch lock collar. (Provide each with manual balancing damper.)
   4. Round Supply Take-Offs: Use factory fabricated rectangular to round type galvanized steel fittings and 26 ga manual balancing damper with 2 wing nuts and handle. System to be Crown Model 3300-DS or approved substitute. Provide 2" standoff bracket.
   5. Round Return/Exhaust Tap-ins: Use factory fabricated beaded straight spin-in type galvanized steel tap fittings.
   6. For low pressure return and/or exhaust application of duct connectors to square ceiling mounted grilles or registers, use factory fabricated square-to-round galvanized steel minimum 3" deep adapter boxes having 2" long beaded round collar.

J. Vanes and Deflectors:
   1. Vanes and deflectors to be galvanized steel sheet same thickness as used in ductwork of corresponding size. Vanes to be securely anchored to duct or casing and have freestanding edges braced as necessary for making rigid.

K. Transitions:
   1. Increase-in-area transition: Transformation slope not to exceed 20°.
   2. Decrease-in-area transition: Transition slope to be maximum 30°, but 20° is preferable.
   3. Angle of transformation at connections to heaters or other equipment not to exceed 30° on approaching side of equipment and 45° on leaving side. Angle of approach may be increased to meet space conditions when transformation section is provided with vanes.

L. Elbows:
   1. Elbows shall be either full radius type or square throat with turning vanes. No mitred elbows allowed. Short radius elbows with vanes also allowed.
   2. Unvaned full radius elbow, shall have throat radius equal to width of duct and full heel radius over than 36" in width.
   3. All square heel elbows shall have 3" square throat elbow with large class single thickness vanes thru 36" unsupported vane length and large double thickness vanes for unsupported vane length of 37" thru 72" as per SMACNA Manual Figures 2-3 and 2-4.

2.04 AIR FILTERING EQUIPMENT

A. All air units, and package terminal units shall be provided with air filters. Filters shall be installed in the return air upstream from any heat exchanger or coil, in an approved convenient location and shall be easily accessible for removing to clean or replace. 1" thick filters to have UL Class 2 rating, 2" and above to have UL Class 1 rating.

B. Air filters shall be of the types specified below. Type of filter required in each case, arrangements, sizes, capacities number of cells, and other requirements not specified hereinafter shall be as indicated on the drawings or as recommended by the unit manufacturer.

C. Split System Air Unit Filters shall be Farr Cam Farr 20-20, 1" thick pleated disposable type. Each filter to have a non-woven cotton and synthetic fabric media, media support grid and enclosing frame. The filter to be UL listed Class 2. The filter to have 20% efficiency by ASHRAE Test 52-76. Initial air resistance to be 0.09" WG at 250 FPM.

D. Media Fill: Provide filter media as follows:
   1. Initial fill for each filter of each type installed for testing and adjusting AC system, and left in place for Owner's immediate use.
   2. One complete spare fill for each filter of each type for Owner's future use. Store all spare media on premise in factory sealed containers, and obtain signed receipt therefore from Owner's authorized representative.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install Air Distribution Equipment as specified above and as recommended by manufacturer.

B. Sheet metal ducts shall be securely supported, hung or suspended by metal trapeze hangers or straps having a minimum width of one inch. Nails or screws shall not be driven through the duct walls.

C. All duct joints and seams shall be securely fastened and sealed to make air tight. All leaks shall be sealed with Hardcast.

D. All exposed openings in fan housing shall be protected with screens or gratings. All fans shall have belt guards on exposed drives.

E. Flexible duct connectors shall not pass through a fire wall or a partition having a fire resistance rating of (1) hour or more.

F. Do not install flexible ducts that have more than a 90° turn.

G. Contractor to verify duct sizes and fittings required with actual field measurements before fabrication of ductwork. The contractor shall not receive compensation for ductwork fabricated that cannot be used. See section 3.02.

3.02 EXCESSIVE NOISE AND VIBRATION

A. All air distribution equipment was selected for a noise level recommended for the space it serves. Any equipment causing excess noise or vibration will be replaced at the Contractor's expense.

END OF SECTION

SECTION 23 34 24

A-SERIES VERTICAL PACKAGED AIR CONDITIONERS & HEAT PUMPS

PART 1 GENERAL

1.01 MANUFACTURES

A. Friedrich

B. GE

C. Amana

PART 2 PRODUCTS

2.01 PRODUCTS

A. All units shall be factory assembled, piped, wired and fully charged with R-410A. All units shall be certified in accordance with ARI Standard 390 for Single Packaged Vertical Air Conditioners and Heat Pumps. Units shall be ETL listed and carry a ETL label. All units shall be factory run-tested to check operation and be manufactured by Friedrich or equivalent.

B. The basic unit shall not exceed 23 1/8" wide x 23 1/8" deep. Overall height of the unit from the bottom of the isolators to the top of the duct collar shall not exceed 32 ¼" for models up to 12,000 Btu , 47 ¼" for 18,000 Btu models, and 51 1/4" for 24,000 Btu models. The unit shall be designed so that the unit will insert into a factory supplied wall plenum 2 3/8" to minimize room intrusion. Factory supplied wall plenums shall allow for installation through walls from 4 ½" – 14" in thickness. Wall plenums will be adjustable to minimize installation clearances. Unit shall draw in ambient air through upper portion of an outside architectural louver measuring 25 9/16" wide x 31 1/16" high and shall exhaust heated air out through the lower portion of the louver. The unit shall be secured to the architectural louver by means of a two-part, weather-resistant wall plenum. The unit shall be capable of left, right or straight-in installations into mechanical closet without field modifications.

1. REFRIGERATION SYSTEM – The refrigeration system shall be hermetically sealed and consist of a rotary compressor that is externally mounted on vibration isolators no smaller than 1 ¾" dia. x 1 ½" high; condenser and evaporator coils constructed of copper tubes and aluminum plate fins; and capillaries as expansion devices. Unit shall have a fan slinger ring to increase efficiency and condensate disposal. A primary condensate removal system consisting of ¾" FTP fittings on multiple locations shall exist. A secondary overflow from the primary drain pan shall expel water to the outside of the building through the wall plenum and louver in the event that the primary drain line clogs.
2. HANDLING SECTION – The condenser fan shall be driven by a single BLDC fan motor for models up to 12,000 Btu. 18,000 and 24,000 Btu models shall utilize a separate motor for both the indoor and outdoor air sections. Airflow shall be directed vertically up through a standard 10" flex duct starter collar and into flexible or rigid ducts to be distributed into the conditioned area on models up to 18,000 Btu. Starter collar shall have both crimped edge to ease flex duct installation and a waistline to prevent duct from loosening.
   a. The chassis shall have a built-in damper capable of providing up to 60 CFM of fresh air into the conditioned area. A fine mesh screen shall filter the incoming fresh air. The damper can be controlled by a slide lever located on the front of the unit.
3. CONTROLS – The unit shall be factory equipped with terminal strip for connection to a standard 24-volt single-stage heat/cool thermostat. A 24-volt transformer shall be included and factory wired. Low voltage inputs will include: C (common), R (24V power), Y

(cooling), G (fan), W (heat) and B (reversing valve on VHA heat pumps only).The unit shall be hard-wired and have a quick-disconnect to disable power for control box service. An emergency heat override switch must be available to allow operation of the resistance heater in the event of a compressor failure on heat pump models.

4. GENERAL CONSTRUCTION – The unit shall be constructed of 18-gauge galvanized zinc-coated steel. The unit shall feature ½" foil backed insulation for sound and thermal efficiency.
   a. The wall plenum (required factory accessory) shall be shipped separately and constructed of 20-gauge galvanized zinc-coated steel; pretreated with zinc-phosphate and sealed with a chromate rinse, then powder-coated for maximum coverage and protection. The plenum shall be black in color for minimal visibility of unit from exterior of building. The plenum shall be shipped with a protective weatherboard for use prior to final installation of the louver and chassis.
   b. The architectural louver (required factory accessory) shall be shipped separately and fabricated from extruded anodized aluminum with louvers in the horizontal plane.
   c. The unit shall include vibration isolators mounted under the chassis and a nonrigid plenum-to-chassis connection to isolate vibrations to the building.
   d. The unit shall have a plastic fan, fan shroud and drain pan and aluminum outdoor coil endplates for corrosion protection and to help prevent rust on the side of the building below the outdoor louver.
   e. The unit shall be shipped with return air filter brackets and a 14" x 20" or 18" x 20" filter affixed directly on to the unit chassis. Optional return air grilles and access panels shall be available as factory accessories for installation in the wall or door of the mechanical closet.
5. CORROSION PROTECTION - The unit shall feature corrosion -resistant materials and finish to help prevent deterioration.
   a. The outdoor coil shall have Diamonblue advanced corrosion protection consisting of hydrophilic-coated fins to prolong the life of the coil in all applications including seacoast protection.
6. ACCESSORY ACCESS PANEL - An optional factory-supplied access panel shall be available to provide access to the unit and adequate return air. The panel shall feature a filter holder to accept a field supplied 25” x 20” x 1” filter. Kit shall contain a hinge bracket for mounting the door with the return air openings high or low on the door for optimal sound attenuation.

SECTION 3 WARRANTY

3.01 The warranty is one year on all parts and labor and 5 years on the sealed system, parts and labor, including compressor, indoor and outdoor coils and refrigerant tubing.

END OF SECTION

SECTION 23 81 26

SPLIT SYSTEM HEAT PUMP SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. The work required under this section includes all work and materials required to install a Split-System Heat Pump.

B. The work is subject to the requirements of the Mechanical General Provisions.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. General Provisions, Section 230500.

B. Basic Materials & Methods, Section 230510.

C. Refrigerant Piping, Section 232300.

D. Air Distribution, Section 233000.

1.03 QUALITY ASSURANCE

A. Perform work of this section using skilled workers who are trained and experienced in the required crafts and who are knowledgeable and familiar with the specified requirements and the methods to be used for proper performance of the work.

PART 2 PRODUCTS

2.01 SPLIT SYSTEM HEAT PUMP (INDOOR UNIT)

A. The integral fan section shall consist of a belt-driven, centrifugal type blower mounted on a rigid steel frame secured to the blower housing by rubber mounts. Blower wheels shall be statically and dynamically balanced. Wheels shall be carried on rubber enclosed, self-aligning, solid bronze grooved, graphite filled bearings provided with grease cups for lubrication. Motor mount design shall permit both belt adjustment and pulley alignment.

B. The cooling section shall consist of a DX coil, split face capacity mounted in a cabinet, matching the main blower cabinets. Refrigerant lines shall be factory piped to outside of the cabinet and the thermostatic expansion valve shall be factory installed. Condensate drain pan shall be 1-1/2" deep, coated on both sides with corrosion resistant material and shall have two 3/4" drain connections. Coil cabinet shall be factory insulated with foil covered insulation.

C. The heating section shall be electric of the specified size shown on the drawings. The electric heating element shall be low watt density, open-wire type element designed for single zone application. The heating bank shall be equipped with automatic and manual reset high temperature safety cut-outs, contactors, and divided into not more than 48 amp circuits with 60-amp fuses all pre-wired to the main control panel. The heating element shall be circuited to prevent electric heating operation during the cooling cycle. Internal heating and cooling power wiring shall terminate at a single junction in the unit panel.

D. Air Filters:

1. Provide each air handling unit with a 1" thick pleated disposable filter, Farr 20-20 or approved equal. The filters shall be UL Class 2, with 20% efficiency based on ASHRAE Test 52-76. Each filter shall have a non-woven cotton and synthetic fabric media, with media support grid and enclosing frame. Initial air resistance to be 0.09" WG at 250 FPM.
2. Provide an initial fill of filter media as described above installed for testing and adjusting of system, and left in place for Owner's immediate use. Additionally, provide one complete spare fill for each filter of each size for Owner's future use. Store all spare media on premises in original factory sealed containers, at a location as directed by the Owner's representative and obtain a signed and dated receipt for this spare media from the Owner's representative.

E. Provide a low-voltage, two-stage heating, one or two stage cooling thermostat with automatic changeover. Provide clear plastic locking cover. All unit wiring and controls shall be in

accordance with NFPA requirements. All controls shall be furnished with the equipment as described under controls.

F. Each unit shall be suitable for air-to-air heat pump operation with a COP of not less than 2.8 at 47 degrees DB outside air, and a total unit cooling EER of 7.5 or greater when tested in accordance with ARI Standard 240. Each shall have an automatic defrost system, electric device to provide minimum of a 5 minute delay to prevent short cycling, emergency heat switch and indicator light to energize auxiliary heat if the compressor is inoperative due to a tripped safety device. Units shall bear UL and ARI labels. Units shall be covered by a 1-year warranty on all parts, including labor for replacement, plus an additional 4 year warranty on compressor.

G. A unit electrical disconnect shall be integral and furnished with the unit.

H. All units shall be of the same make and manufacturer.

I. Provide 1" Farr 20-20 filters.

2.02 OUTDOOR AIR-COOLED CONDENSING UNIT

A. Provide air to air electric heat pump condensing unit of cooling capacity noted on drawing and/or schedule.

B. Compressor unit(s) shall be welded, fully hermetic with crankcase heater(s) and vibration isolators. Units shall be designed to operate at +10 degrees F ambient on heating. Compressors shall have 5-year warranty.

C. Condenser fans and motors shall be direct drive fans with aluminum blades and zinc plated steel hubs. Motors with permanently lubricated ball bearings and built-in current and thermal overload protection. Vary condenser fan speed to provide low ambient cooling as called for on drawings.

D. Condenser coils shall be air-cooled condenser coil, aluminum fin secondary surface mechanically bonded to primary surface of seamless copper tubing. Sub-cooling circuit with liquid accumulator. Factory tested at 425 psig air pressure under water. Vacuum dehydrated at 175° F.

PART 3 EXECUTION

3.01 Install all units in strict accordance with manufacturer's installation and mounting instructions. Install units plumb and level, firmly anchored in locations indicated.

3.02 Provide the services of a manufacturer's authorized representative to supervise the mounting, installation, power, and control wiring (including required interlocks) of all units. Upon completion of all work, notify the engineer in writing that all units are operating properly, and are complete and satisfactory in all respects.

3.03 Verify prior to bidding that all units meet all electrical characteristics shown in the contract documents. This shall include voltage, phase, full load amps and overcurrent protection. Coordinate exact electrical requirements with electrical contractor prior to rough-in.

3.04 Provide full twelve month warranty for all parts and labor. Provide an extended four year warranty (parts only) for compressors.

3.05 Install full size type "M" copper condensate drain with 4" deep p-trap running to floor drain.

3.06 All units shall have an auxiliary drain pan with a float switch wired to shut units down on water rise.

3.07 FILTER MEDIA FILL

A. Provide initial filter media fill as described hereinbefore for each filter of each type installed for testing and adjusting AC system and left in place for Owner's immediate use.

B. Provide one complete fill and each filter of each type for Owner's future use. Store all media on premises in factory sealed containers, at a location as directed by the Owner's authorized representative. Obtain a signed receipt for these filters and include in project close-out documents.

END OF SECTION

SECTION 23 81 29

MULTIPLE INDOOR UNIT DUCTLESS SPLIT SYSTEM

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. The variable capacity, heat pump air conditioning system shall be a Mitsubishi, Samsung or Daikin.

B. The system shall consist of the outdoor unit, multiple indoor units, and DDC (Direct Digital Controls). The outdoor unit shall be a horizontal discharge, 208/230 volt, single-phase unit. Each indoor unit or group of indoor units shall be independently controlled.

1.02 QUALITY ASSURANCE

A. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

D. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 1230.

E. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

PART 2 – WARRANTY

2.01 The units shall be covered by the manufacturer's limited warranty for a period of one (1) year parts and six (6) year compressor to the original owner from date of installation.

PART 3 – PRODUCTS

3.01 OUTDOOR UNIT

A. General:

The outdoor units shall be equipped with multiple circuit boards that interface to the controls system and shall perform all functions necessary for operation. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The sum of connected capacity of all indoor units shall range from 50% to 130% of outdoor rated capacity.
2. Outdoor unit shall have a sound rating no higher than 59 dB(A).
3. Both refrigerant lines from the outdoor unit to indoor units shall be individually insulated.
4. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
5. The outdoor unit shall have a high pressure safety switch, low pressure safety switch and over-current protection and DC bus protection.
6. The outdoor unit shall have the ability to operate with a maximum height difference of 98 feet and have a total refrigerant tubing length of 393 feet. The greatest length is not to exceed 262 feet between the outdoor unit and the indoor units and shall not require line size changes nor traps.
7. The outdoor unit shall have rated performance for heat operation at 0°F for the ambient temperature without additional low ambient controls.
8. The outdoor unit shall be capable of cooling operation down to 23°F outdoor ambient without additional low ambient controls.
9. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

B. Unit Cabinet:

1. The casing shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:
   1. The unit shall be furnished with two direct drive, variable speed motors.
   2. The fans will be forward curved type blades for quiet operation.
   3. The fan motor shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
   4. The fan motor shall be mounted for quiet operation.
   5. The fan shall be provided with a raised guard to prevent contact with moving parts.
   6. The outdoor unit shall have horizontal discharge airflow.

D. Refrigerant
   1. R410A refrigerant shall be required for all outdoor unit systems.

E. Coil:
   1. The outdoor coil shall be of nonferrous construction with lanced or corrugated fins on copper tubing.
   2. The coil fins will have a factory applied corrosion resistant blue-fin finish.
   3. The coil shall be protected with an integral metal guard.
   4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

F. Compressor:
   1. The compressor shall be a single high performance, inverter driven, modulating capacity scroll compressor.
   2. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable down to 41% of rated capacity.
   3. The compressor shall be equipped with an internal thermal overload.
   4. The compressor shall be mounted to avoid the transmission of vibration.

G. Electrical:
   1. The outdoor unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
   2. The unit shall be capable of satisfactory operation within voltage limitations of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)
   3. The outdoor unit shall be controlled by integral microprocessors.
   4. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair, non-polar shielded cable to provide total integration of the system.

3.02 WALL MOUNTED INDOOR UNIT

A. General:
   1. The unit shall be a wall-mounted indoor unit section and shall have a modulating linear expansion device and a flat front.

B. Indoor Unit
   1. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:
   1. All casings, regardless of model size, shall have the same white finish
   2. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining shall be standard.
   3. There shall be a separate back plate which secures the unit firmly to the wall.

D. Fan:
   1. The indoor fan shall be an assembly with one or two line-flow fan(s) direct driven by a single motor.
   2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
4. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.

E. Filter:
1. Return air shall be filtered by means of an easily removable, washable filter.

F. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. Both refrigerant lines to the indoor units shall be insulated in accordance with the installation manual.

G. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)

H. Controls:
1. This unit shall use controls provided by the manufacturer to perform functions necessary to operate the system.
2. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

END OF SECTION

SECTION 23 81 50

DUCTLESS SPLIT SYSTEM HEAT PUMPS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Common Work results for HVAC 230500.

C. Insulation, Section 230700.

D. Refrigerant Piping, Section 232115.

1.02 SUMMARY

A. Section Includes:
   1. The work required under this section includes all work necessary for the complete installation of ductless split system units.

B. The work of this section is subject to the requirements of the Mechanical General Provisions and Basic Materials Specifications.

1.03 SUBMITTALS

A. Provide drawings indicating dimensions, rough-in connections, electrical characteristics, unit performance, agency listings, and connection requirements.

B. Provide manufacturer's installation and start-up instructions.

C. Provide manufacturer's color selection charts.

D. At job closeout, provide manufacturer's installation, operation and maintenance data along with product warranty certificate.

1.04 WARRANTY

A. Provide one-year warranty on all parts and five year warranty for refrigeration compressors.Verify available warranties and warranty periods with manufacturers listed in Part 2 articles.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Furnish and install where shown on plans, ductless split system units of sizes and capacities shown on the schedule. The units shall include the indoor evaporator section and the outdoor condenser section. Approved manufacturers shall be as follows:
   1. EMI
   2. Mitsubishi
   3. Sanyo

2.02 WALL HUNG EVAPORATOR SECTION

A. Provide wall hung heat pump units with back-up resistant heat as shown on schedule. Provide hanger brackets and or trim kits as applicable.

B. Cabinet shall be constructed of cold roll steel, with structural stiffeners and powder coated finish. Inlet panel construction of high impact polystyrene with perforated steel inlet grille.

C. Discharge grille shall be high temperature Noryl with adjustable vanes.

D. Condensate drain pans shall be galvanized steel with anti-corrosion coating.

E. Fan shall be tangential type, directly mounted to the motor shaft. Motor shall be PSC type with overload protection.

F. Filter shall be permanent, washable and user accessible.

G. Coil shall be seamless copper tubing, arranged in staggered configuration, with enhanced aluminum fins, tested to 460 PSIG. Tubes shall be mechanically expanded for secure bonding to fin shoulder. Connections are sweat type.

H. Controls shall include relays and connections for condensing unit.
   1. Unit mounted controls with thermostat, fan speed control, and heat/cool switch.
   2. Wall mounted 24V thermostat with fan, and heat/cool switch.

2.03 CEILING CASSETTE EVAPORATOR SECTION

A. Provide ceiling concealed heat pump (or cooling only) units as scheduled with back-up electrical heat as shown in the schedule. Provide mounting and trim kits as applicable.

B. Cabinet shall be constructed of galvanized steel, with thermal and acoustic fire resistant foam insulation.

C. Supply and return air FASCIA shall be constructed of high impact poystrene and have a pearl gray finish.

D. Integral condensate pump with safety switch and 18” lift.

E. Fans shall be backward curved centrifugal impeller design with multi-speed motors with overload protection.

F. Filter shall be permanent, washable and user accessible.

G. Coil shall be seamless copper tubing arranged in a staggered configuration with enhanced aluminum fins, tested to 460 PSIG.

H. Controls shall be as follows:
   1. With relays and connections for condensing unit and power supply.
   2. Remote low voltage thermostat with automatic summer/winter changeover and manual or automatic fan control.
   3. Anti-short cycle compressor protection.
   4. Fan purged with 60 second delay for maximum heating/cooling efficiency.

2.04 CONDENSER SECTION

A. Provide a single zone condensing unit with 4-way reversing valve, solenoid activated by 24V, energized for cooling operation. Provide unit with a TXV with internal check valve to provide proven operation through all temperature ranges in heat pump mode.

B. Cabinet shall be constructed of G-60 galvannealed steel, finished with corrosion inhibiting, high-gloss, powder coated. Fan guard shall be heavy-gauge, vinyl dipped wire, or stamped integral to cabinet.

C. Compressor shall be hermetically sealed, high efficiency type. Motor shall be PSC type with internal overload protection. Compressor shall be installed on resilient mountings. Minimum unit SEER shall be 10.0 and minimum COP=2.8 in reverse cycle heating mode.

D. The condensing unit and evaporator section shall be precharged with refrigerant. Unit refrigeration valves shall be solid brass for sweat connection.

E. The condenser coil shall be seamless, copper tubing, arranged in staggered configuration, with enhanced aluminum fins. The tubes shall be mechanically expanded for secure bonding to fin shoulder.

F. The condenser fan shall be high efficiency propeller type, directly connected to the totally enclosed PSC motor. The motor shall be internally and thermally protected. The condensing unit shall be draw-through design.

G. System options shall include low ambient operation to 0 degrees F. Other system options shall be as noted on schedule.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install unit in accordance with manufacturer’s recommendations.

B. Verify prior to bidding that all units meet all electrical characteristics shown in the contract documents. This shall include voltage, phase, full load amps, and overcurrent protection. Coordinate exact electrical requirements with the electrical contractor prior to rough-in.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section, Division 26.

1.02 SUMMARY

A. Section Includes:
   1. Electrical equipment coordination and installation.
   2. Common electrical installation requirements

1.03 SCOPE

A. The work to be performed under this section shall require the contractor to provide all, labor, materials, equipment, and services proper to the installation of the work indicated on the electrical drawings, the principle features of which are as follows:
   1. A power wiring system for distribution of power throughout the building.
   2. Lighting fixtures, lamps and lighting controls.
   3. A system of conduit, outlets, cabinets for the installation of wiring and equipment for the communications facilities.
   4. Conduit, conductors, outlets and disconnect switches, and connections for the heating, ventilation, air conditioning and plumbing facilities.
   5. Temporary wiring.
   6. Fire alarm systems.

B. The drawings indicate the general character, scope and arrangement of the electrical installation. Request for any change or departure from these drawings must be submitted to the Architect for approval.

C. The contractor shall be governed by the present specifications together with the current recommendations and regulations of the following:
   1. City Electrical Code
   2. State Electrical Code
   3. Rules of the Electric Utility Company
   4. National Electrical Code
   5. International Energy Conservation Code
   6. International Building Code
   7. N.E.M.A. Standards
   8. N.F.P.A. Codes
   9. Underwriters Laboratory Standards

D. Obtain all permits and inspections required for the work and pay all fees and costs thereof.

E. No changes in contract price will be allowed for alternate work which requires approximately the same amount of material and labor. The owner reserves the right to relocate any equipment up to 10 feet in any direction prior to rough-in.

1.04 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames" and shall be furnished as required.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

E. Before submitting bid, Contractor shall visit the job site for the purpose of examining the site and conditions under which the work must be performed. No adjustment to the contract will be allowed for situations arising from failure of Contractor to thoroughly familiarize himself with site and existing building conditions, including charges and requirements from utilities as shown for the project. Contractor shall verify that connections to existing equipment are as indicated on drawings and specifications. Any deviations shall be reported to the Engineer immediately. Any deviations shall be reported prior to bidding.

F. Wiring for Mechanical Equipment:
   1. All power wiring and conduit for items Furnished under Division 23 shall be furnished and installed under Division 26. See 6a. Verify the electrical characteristics of items to be connected with equipment nameplate data and drawings prior to rough-in.
   2. All disconnects shall be furnished and installed by Division 26.
   3. Manual motor starters for ½ HP motors and less shall be furnished and installed by Division 26.
   4. Wiring and conduit for solenoid valves, and control transformers including the transformers shall be furnished and installed by Division 23.
   5. Division 26 shall install all starters, toggle switches, disconnects, and all wiring to the respective motor or device. Wiring and conduit from starter to the controller or control device and any interlocked dampers shall be by Division 23.
   6. Definitions:
      a. Power wiring: Line voltage circuitry rough-in including conduit, boxes, conductors, etc. between the overcurrent protection and the equipment including the connection of the starters by Division 26.
      b. Control wiring: Any voltage circuitry rough-in including conduit, boxes, conductors, etc. between control activator and the controller or starter by Division 23.
   7. Conduit: All power wiring and line-voltage control wiring shall be in conduit.
   8. Smoke Detectors and Firestats:
      a. Smoke detectors shall be furnished by Division 26. Upon activation of the fire alarm system the fire alarm control panel shall send a signal to the HVAC unit controls to cause immediate shutdown. Furnish all required fire alarm control modules. Coordinate HVAC unit shutdown with mechanical contractor. Wiring from the detector to fire alarm system shall be furnished and installed by Division 26.
      b. All firestats shall be furnished, installed and wired by Division 23.

G. Connect all motors with an 18” length of liquidtight flexible metal conduit. Use proper type connectors and anchors with this type conduit.

H. Refer to architectural drawings for details such as finishes, dimensions, materials, etc. Refer to equipment plans for exact location of electrical connections, which are dimensioned prior to any rough-in of work. Confirm any dimensioned drawings with equipment rough-in drawings.

I. Protection of Roof:
   1. Coordinate electrical work with roofing work in regard to any electrical items which may pierce or otherwise affect the roof.
   2. Arrange for any cutting or repairing to roofing which might already be installed when an electrical installation is made.
   3. Roof penetrations shall not void roofing warranty. Penetrations shall be coordinated with roofing supplier holding the warranty. Electrical contractor shall coordinate with roofing supplier for installation of pre-molded pipe seal or field fabricated pipe penetration as

applicable. Electrical contractor to include all costs and coordination with and for roofing penetrations, new or existing.

4. Routing of electrical wiring thru ductwork, and penetrations of ductwork or roof curbs is not allowed.

J. Record Drawings:

1. Furnish reproducible record drawings showing the changes and modifications that occurred during the construction period.
2. The job supervisor shall maintain a set of prints in the job office to be used to illustrate and note the job changes as they occur. These drawings shall be kept current daily.

K. Temporary Power Wiring: Throughout the building, provide one pigtail lampholder for every 100 square feet. Provide a 100-watt incandescent (or comparable compact fluorescent, HID, or LED) lamp in each pigtail; Provide a 120-volt GFCI duplex plug receptacle for every 500 square feet and with at least one in each room of 200 square feet or more. Wiring shall be with grounded type non- metallic sheath cable. Conform to the National Electrical Code and the requirements of OSHA. All temporary power wiring, devices, and supports shall be completely removed prior to project completion.

L. Include in the bid price all utility company costs relative to the types of new or modified services planned. Before submitting bid, Contractor shall contact the Electric Utility Company, the Telephone Company, the Cable Television Company and any other utility or service providers to whose services the project shall be connected. The Contractor shall verify with each company the final service arrangements and all costs involved which are to be included in the bid price. The services illustrated on the drawings are based on information which was available at the time of releasing the project for bidding.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items. Where minimum clearances are indicted, measure to any protruding fasteners, supports, or other components.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements. Do not obstruct 7’-0” minimum clear headroom along service and egress paths. If project conditions require an installation below 7’-0” along such paths, notify the Architect prior to rough-in.

D. Equipment: Install to facilitate service, maintenance, repair and/or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.02 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07, Section "Penetration Firestopping."

END OF SECTION

SECTION 26 05 10

POWER SERVICE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Electrical power service shall be arranged with the local electric power distributor. Pay any and all charges as required by the power utility company.

B. Provide grounding in accordance with the National Electrical Code and as shown on the drawings. Refer to Division 26, Section "Grounding and Bonding for Electrical Systems."

C. The power service shall be as noted on drawings. Provide metering as required by the power utility company.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Refer to Division 26, section "Grounding and Bonding for Electrical Systems" for service grounding materials.

B. Refer to Division 26, sections 'Raceway and Boxes for Electrical Systems" and also "Underground Ducts and Raceways for Electrical Systems" for service raceways.

C. Refer to Division 26, section "Low-Voltage Electrical Power Conductors and Cables" for service conductors.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Confirm with the power utility company the power service arrangements. Include in the bid price all costs relative to the type of service planned.

B. Where service arrangements call for a new pad-mounted utility transformer, the contractor shall be responsible for providing a poured-in-place concrete pad for the transformer. Obtain a current copy of the power utility company's requirements for such pad and include all associated costs in the bid price. Transformer pads for buildings 2 thru 9 shall be fiberglass pads. Coordinate pad type for building No. 1 with the power company.

C. Unless detailed differently by the utility company, pad mount transformers shall have a ground rod placed at each corner of the pad a minimum of 10' apart and interconnected. Extend grounding electrode conductor through the pad window into the transformer enclosure for the termination by the utility company. Grounding conductors shall be of the same size as the service grounding electrode conductor. Refer to Division 26, section "Grounding and Bonding for Electrical Systems."

D. Service entrance equipment shall bear the equipment grounding bus and the grounded conductor (neutral) bus bonded together at the first point of overcurrent protection. Bonding shall be per Article 250 of the National Electrical Code. Service entrance equipment shall be listed for such purpose by Underwriters Laboratory.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. General Cable Technologies Corporation.
   2. Service Wire Co.
   3. Southwire Company.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable used in Variable Frequency Controller circuits.

D. Conductors: Copper, complying with NEMA WC 70/ICEA S-95-658.
   1. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2 or Type XHHW-2.
   2. PV Conductor Insulation: Comply with UL 4703.

E. Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2.02 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. 3M Electrical Products.
   2. Hubbell Power Systems, Inc.
   3. ILSCO.
   4. O-Z/Gedney; a brand of Emerson Industrial Automation.
   5. Service Wire Co.
   6. Thomas & Betts Corporation, A Member of the ABB Group.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS FOR BUILDING NO. 1

A. Service Entrance: Type THHN/THWN-2 or Type XHHW-2, single conductors in raceway.

B. Feeders: Type THHN/THWN-2 or Type XHHW-2, single conductors in raceway.

C. Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway or Type MC cable.

D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Type THHN/THWN-2 or Type XHHW-2, single conductors in raceway.

3.03 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS FOR BUILDINGS NO. 2 THRU NO. 9

A. Service Entrance: Type THHN/THWN-2 or Type XHHW-2, single aluminum conductors in raceway.

B. Feeders: Type THHN/THWN-2 or TypeXHHW-2, single aluminum conductors in raceway. See drawings for locations called out as aluminum conductors.

C. Branch Circuits, Including in Crawlspaces: Type “NM” non-metallic sheathed cable shall be used for 20 and 30 amp branch circuits in day locations in the townhomes.

D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Type THHN/THWN-2 or Type XHHW-2, single aluminum conductors in raceway.

3.04 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips, which will not damage cables or raceway.

3.05 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.06 IDENTIFICATION

A. Identify and color-code conductors and cables according to the "Identification for Electrical Systems” Section.

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor. Cap or tape spare conductors at each end.

3.07 FIRESTOPPING

A. Apply fire stopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.08 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. After installing conductors and cables and before electrical circuitry has been energized, test all conductors for compliance with requirements.
   2. Perform each of the following visual and electrical tests:

a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
b. Test bolted connections for high resistance using one of the following:
   1) A low-resistance ohmmeter.
   2) Calibrated torque wrench.
c. Inspect compression applied connectors for correct cable match and indentation.
d. Inspect for correct identification.
e. Inspect cable jacket and condition.
f. Insulation-resistance test on each conductor with respect to ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for one-minute duration.
g. Continuity test on each conductor and cable.
h. Uniform resistance of parallel conductors.

B. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes grounding and bonding systems and equipment, plus the following special applications:
   1. Underground distribution grounding.
   2. Ground bonding common with lightning protection system.
   3. Foundation steel electrodes.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Burndy; Part of Hubbell Electrical Systems.
   2. ERICO International Corporation.
   3. ILSCO.
   4. O-Z/Gedney; a brand of Emerson Industrial Automation.
   5. Thomas & Betts Corporation, a Member of the ABB Group.

2.02 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.03 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
   4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 12 inches (in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.04 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.05 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 - EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 4/0 AWG minimum, unless noted otherwise on the drawing.
   1. Bury at least 24 inches (600 mm) below grade.
   2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow. Provide isolated ground bus in the panelboards and switchboards as required.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated. Ground Bus shall be readily accessible and available for use by communications installers.
   1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated. Minimum length of bus shall be 12”

E. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors or compression connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Welded connectors or compression connectors.

3.02 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.03 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.04 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Pad-Mounted Transformers: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install copper conductor not less than No. 2/0 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation. This is the minimum requirement; provide additional grounding per local codes and utility requirements.

3.05 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated. Provide separate isolated grounding bus in panelboards and switchboards with isolated ground requirements. Provide isolated ground conductor in feeders.

C. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.06 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 12 inches below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
   2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
   3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

F. Bond grounding conductor and grounding electrode conductor to reinforcing steel per National Electrical Code requirements.

3.07 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   3. Test completed grounding system at service disconnect enclosure grounding terminal and as required by the National Electrical Code. Make tests at ground rods before any conductors are connected.
      a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
      b. Perform tests by fall-of-potential method according to IEEE 81.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Report measured ground resistances that exceed 10 ohms.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Designer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame Rating: Class 1.
   2. Self-extinguishing according to ASTM D 635.

2.02 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. GS Metals Corp.
      b. G-Strut.
      c. Unistrut; Part of Atkore International.
   2. Material: Galvanized steel.
   3. Channel Width: 1-5/8 inches minimum, other dimensions as required.
   4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   5. Channel Dimensions: Selected for applicable load criteria.

B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used. Plastic expansion anchors of any type shall not be used.
   2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
   3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
   4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
   5. Toggle Bolts: All-steel springhead type.
   6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.

B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter. Where conduit supported is 2-1/2" trade size or larger, minimum rod size shall be 3/8 inch (10mm) in diameter.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with single-bolt conduit clamps.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening such raceways to trapeze supports.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMTs, IMCs, and RMCs may be supported by openings through structure members, according to NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
   6. To Light Steel: Sheet metal screws.
   7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars. Anchoring in concrete with post tension cables not allowed unless noted otherwise.

3.03 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base. Bases shall be not less than 4 inches (100 mm) thick.

B. Use 4000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03, Section "Miscellaneous Cast-in-Place Concrete".

C. Anchor equipment to concrete base as follows:
   1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor bolts to elevations required for proper attachment to supported equipment.
   3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.04 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Metal conduits, tubing, and fittings.
   2. Nonmetal conduits, tubing, and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Surface raceways.
   5. Boxes, enclosures, and cabinets.
   6. Handholes and boxes for exterior underground cabling.

1.03 DEFINITIONS

A. RMC: Galvanized rigid steel conduit/Rigid Metal Conduit.

B. GRS: See RMC.

1.04 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.01 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by but not limited to one of the following:
   1. Allied Tube & Conduit; a part of Atkore International.
   2. Western Tube and Conduit Corporation.
   3. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RMC: Comply with ANSI C80.1 and UL 6.

D. EMT: Comply with ANSI C80.3 and UL 797 – steel or aluminum.

E. FMC: Comply with UL 1; zinc-coated steel or aluminum.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
   2. Fittings for EMT shall be steel, set screw or compression type.
   3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

H. Joint Compound for RMC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. CANTEX INC.

2. Carlon: Thomas & Betts Corporation,

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

E. Solvents and Adhesives: As recommended by conduit manufacturer.

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Metal wireways are **not allowed** unless shown on the drawings. Refer to Part 3.2.

B. Manufacturers: Subject to compliance with requirements, provide products by but not limited to one of the following:
   1. B-line, an Eaton business.
   2. Hoffman; a brand of Pentair Equipment Protection.
   3. Square D.

C. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, Type 4, or Type 12 as required for application, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

E. Wireway Covers: Hinged type or Flanged-and-gasketed type unless otherwise indicated.

F. Finish: Manufacturer's standard enamel finish.

2.04 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by but not limited to one of the following:
   1. Crouse-Hinds, an Eaton business.
   2. EGS/Appleton Electric.
   3. O-Z/Gedney; a brand of Emerson Industrial Automation.
   4. RACO; Hubbell.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

J. Gangable boxes are allowed where multiple wiring devices require it.

K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R, Type 4, or Type 12 as required by location with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

L. Cabinets:
   1. NEMA 250, Type 1, Type 3R, or Type 12 as required by location. Galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.
   6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

A. Above-ground Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: RMC, unless noted otherwise.
   2. Concealed Conduit, Aboveground: RMC, unless noted otherwise.
   3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Above-ground Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Severe Physical Damage: EMT.
   2. Exposed and Subject to Severe Physical Damage: RMC. Raceway locations include the following:
      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   4. Encased in concrete or mortar: RNC.
   5. Damp or Wet Locations: RMC.
   6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment):
      a. Dry Locations: FMC.
      b. Dusty, Damp, or Wet Locations: LFMC.
   7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 in institutional and commercial kitchens and damp or wet locations.

C. Underground: Apply raceway products as specified below unless otherwise indicated:
   1. Below slab, within the building footprint: RNC, Type EPC-40-PVC.
   2. Underground, beyond the building footprint: RNC, Type EPC-40-PVC.
   3. Underground, within 5 feet (1.5 m) of roadways, driveways, or parking areas: RNC, Type EPC-80-PVC
   4. Underground, intended for use by wiring exceeding 600 volts to ground: RNC, Type EPC-80-PVC, unless specifically noted to be Schedule 40.

D. Minimum Raceway Size:
   1. Indoors, outdoors above grade, or below slab within the building footprint: 3/4-inch (21-mm) trade size 21.
   2. Underground, beyond the building footprint: 1-inch (25-mm) trade size 27.

E. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. EMT: Use set-screw or compression type steel fittings. Comply with NEMA FB 2.10.

3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

F. Install surface raceways only where indicated on Drawings.

3.02 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this section are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and site involved. Open flame shall not be used.

H. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

I. Support conduit within 12 inches (300 mm) of enclosures to which attached.

J. Raceways Underground, beyond the building footprint:
   1. Minimum cover depth, measured from finished grade to top of raceway, shall comply with NFPA 70 Article 300 and the following:
      a. Wiring over 600 volts: 42 inches (1065 mm) with warning tape.
      b. Secondary wiring, between utility transformer and service entrance equipment: 24 inches (610 mm) with warning tape.
      c. Within 5 feet (1.5 m) of roadways, driveways, and parking areas: 24 inches (610 mm) with warning tape.
      d. Branch and feeder wiring: 18 inches (460 mm) with warning tape.
   2. Where raceways cross between areas with different minimum cover depth requirements, such as at the edge of a parking area or leaving the building footprint, the transition shall occur in the less-strict area.
   3. Arrange raceways to avoid areas planned for trees or large landscaping.
   4. Where routed parallel with other underground system structures, maintain 5 feet (1.5 m) separation between raceway and foreign system structure.

K. Raceways Embedded in Slabs, within the building footprint:
   1. Run conduit below reinforcement. Arrange raceways to cross building expansion joints at right angles with expansion fittings. In no case shall conduit be run in such a manner as to be exposed to saw cutting.
   2. Transition from RNC to RMC before rising above floor.
      a. Exception: Where raceway turns up concealed in masonry block walls and terminates at a flush-mounted device box not more than 48 inches (1220 mm) above finished floor, elbow fitting and vertical raceway shall be permitted to be Type EPC-80-PVC. Protect such installations from damage or obstruction by debris during installation of masonry.

L. Stub-ups to Above Recessed Ceilings:
   1. Use EMT or RMC for raceways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or at enclosures.

M. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

N. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings.

O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

P. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

R. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire and secure each end to adjacent structure. Cap underground raceways designated as spare above grade alongside raceways in use.

T. Surface Raceways:
   1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
   2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape, glue, and plastic expansion anchors are not acceptable support methods.

U. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

V. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground service raceway enters a building or structure.
   3. Where otherwise required by NFPA 70.

W. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

X. Expansion-Joint Fittings:
   1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
   2. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
   3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Y. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
   1. Use LFMC in damp or wet locations subject to severe physical damage.
   2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
   3. Use FMC for recessed and semi-recessed luminaires.
   4. Arrange flexible conduit to minimize torque force and strain on fittings.

Z. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

AA. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall and plumb. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

BB. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel. Reference drawing for additional information. Provide appropriately rated fire stopping and sound barrier for each box.

CC. Locate boxes so that cover or plate will not span different building finishes or interfere with trim installation.

DD. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

EE. Fasten junction and pull boxes to, or support from building structure. Do not support boxes by conduits.

FF. Junction and/or pull boxes, and wireways, shall not contain conductors from more than six line-to-neutral branch circuits (or an equivalent number of line-to-line circuits) unless indicated on the drawings or approved via written Request for Information (RFI).
   1. Requests shall detail locations and sizes of all such large junction or pull boxes and wireways proposed and include the following:
      a. Explain the construction advantage which would be provided by use of such enclosures instead of individual raceways.
      b. Proposed conduits to be connected and circuits to be contained in each enclosure.
      c. Enclosure size, enclosure fill, and applicable ampacity adjustment factor calculations, all per NEC based on planned conduit and conductors.
      d. Note: Submit RFI prior to rough-in or ordering materials. <u>RFI may not be approved even if calculations are compliant with Code.</u>

   2. Where wireways and large junction or pull boxes are installed, ensure the following:
      a. Branch circuits routed through a common junction or pull box shall not originate from more than one panelboard.
      b. Conductors shall be routed neatly and orderly, and associated ungrounded (hot) and grounded (neutral) on the same circuit shall be grouped per NEC 200.4 (exceptions to this Section shall not be utilized in this application).
      c. Conductors shall be clearly labeled, indicating panel and circuit number.
      d. Provide a typed directory affixed in a plastic sleeve to the outside of the enclosure indicating circuits present within the enclosure.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Cover Requirements – Comply with the greatest requirements of NEC 300.5 and the following. Cover is to be measured from the top of the raceway to finished grade. Where not otherwise noted, minimum cover requirements shall be:
      a. Branch and Feeder Circuits Under Interior Building Slab: Fully below planned concrete thickness.

b. Branch and Feeder Circuits under Driveways and Parking Areas: 24 inches (600 mm) with warning tape.
c. Branch and Feeder Circuits at locations not specified above: 18 inches (450 mm) with warning tape.
d. Secondary Service Entrance Circuits: 24 inches (600 mm) with warning tape.
e. Primary Circuits over 600 volts: 42 inches (1050 mm) or as directed by Utility Provider, whichever is greater, with warning tape.

2. Sleeve conduits where they pass through foundation walls above footings. Do not route through footings. Coordinate lowered footings with General Contractor where required to maintain minimum cover requirements throughout.
3. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
4. Install backfill as specified in Division 31, Section "Earth Moving."
5. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31, Section “Earth Moving."
6. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
7. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
8. Underground Warning Tape: Comply with requirements in Division 26, Section "Identification for Electrical Systems." Where required, install at least 6 inches (150 mm) below finished grade, directly above conduit, with at least 12 inches (300 mm) of fill between tape and top of conduit.

3.04 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.05 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.06 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings, galvanized finishes, or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Identification for raceway and metal-clad cable.
   2. Identification for conductors and communication and control cable.
   3. Underground-line warning tape.
   4. Warning labels and signs.
   5. Instruction signs.
   6. Equipment identification labels.
   7. Miscellaneous identification products.

1.03 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.04 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with 29 CFR 1910.145.

1.05 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.02 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
   1. Not less than 6 inches wide by 4 mils thick.
   2. Compounded for permanent direct-burial service.
   3. Embedded continuous metallic strip or core.

4. Printed legend shall indicate type of underground line.

2.03 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

2.04 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.
   3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.05 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.06 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength: 50 lb, minimum.
   3. Temperature Range: Minus 40 to plus 185 deg F.
   4. Color: Black, except where used for color-coding.

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 APPLICATION

A. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands or snap-around, color-coding bands:
   1. Fire Alarm System: Red.
   2. Fire-Suppression Supervisory and Control System: Red and yellow.
   3. Combined Fire Alarm and Security System: Red and blue.
   4. Security System: Blue and yellow.
   5. Mechanical and Electrical Supervisory System: Green and blue.
   6. Telecommunication System: Green and yellow.
   7. Control Wiring: Green and red.

B. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

C. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

D. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.

E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
   1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
      a. Power transfer switches.
      b. Controls with external control power connections.
   2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

H. Instruction Signs:
   1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
   2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
   1. Labeling Instructions:
      a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.
      b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
      c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   2. Equipment to Be Labeled:
      a. Panelboards, electrical cabinets, and enclosures.
      b. Access doors and panels for concealed electrical items.
      c. Electrical switchgear and switchboards.
      d. Transformers.
      e. Emergency system boxes and enclosures.
      f. Motor-control centers.
      g. Disconnect switches.
      h. Enclosed circuit breakers.
      i. Motor starters.
      j. Push-button stations.
      k. Power transfer equipment.
      l. Contactors.
      m. Remote-controlled switches, dimmer modules, and control devices.
      n. Battery inverter units.
      o. Battery racks.
      p. Power-generating units.

q. Voice and data cable terminal equipment.
r. Master clock and program equipment.
s. Intercommunication and call system master and staff stations.
t. Television/audio components, racks, and controls.
u. Fire-alarm control panel and annunciators.
v. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
w. Monitoring and control equipment.
x. Uninterruptible power supply equipment.
y. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

3.02 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service feeder branch-circuit service, feeder, and branch-circuit conductors.
   1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
   2. Colors for 208/120-V and 240/120-V Circuits:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
   3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

J. Painted Identification: Prepare surface and apply paint according to Division 09 painting Sections.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Time switches.
   2. Photoelectric switches.
   3. Standalone daylight-harvesting switching controls.
   4. Indoor occupancy sensors.
   5. Outdoor motion sensors.
   6. Lighting contactors.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.
   1. Interconnection diagrams showing field-installed wiring.
   2. Include diagrams for power, signal, and control wiring.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.01 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Intermatic, Inc.
   2. NSi Industries LLC.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Contact Configuration: DPST.
   3. Contact Rating: 20-A ballast load, 20-A LED rating, 120-/240-V ac.
   4. Programs: Eight on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
   5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
   6. Astronomic Time: Selected channels.
   7. Automatic daylight savings time changeover.
   8. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.02 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Industries, Inc.
   2. Intermatic, Inc.

3. NSi Industries LLC.

B. Description: Solid state, with DPST dry contacts rated for 4625-VA tungsten or 1800-VA inductive, 20-A LED rating, to operate connected load, complying with UL 773.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range.
   3. Time Delay: Thirty-second minimum, to prevent false operation.
   4. Lightning Arrester: Air-gap type.
   5. Mounting: Twist lock complying with NEMA C136.10, with base.

2.03 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Industries, Inc.
   2. Lithonia Lighting; Acuity Brands Lighting, Inc.
   3. Lutron Electronics Co., Inc.
   4. Philips Lighting Controls.
   5. Sensor Switch, Inc.
   6. Watt Stopper.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
   4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, 20-A LED rating, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   5. Mounting:
      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
      c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
   6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
   7. Bypass Switch: Override the "on" function in case of sensor failure.
   8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
   1. Sensitivity Adjustment: Separate for each sensing technology.
   2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
   3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

2.04 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Lithonia Lighting; Acuity Brands Lighting, Inc.
   2. Lutron Electronics Co., Inc.
   3. Sensor Switch, Inc.
   4. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
   3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent, 600VA LED rating.

C. Wall-Switch Sensor Tag WS1:
   1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft (196 sq. m).
   2. Sensing Technology: Dual technology - PIR and ultrasonic.
   3. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
   4. Voltage: Match the circuit voltage; dual-technology type.
   5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
   6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
   7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
   8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.05 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Corporation.
   2. Siemens.
   3. Square D.

B. Description: Electrically operated and electrically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.
   1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current). Minimum 30 amperes, match circuit voltage.
   2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
   3. Enclosure: Comply with NEMA 250.
   4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.06 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multi-conductor cable with stranded-copper conductors not smaller than No. 18 AWG. Compatible with manufacturers requirement

C. Class 1 Control Cable: Multi-conductor cable with stranded-copper conductors not smaller than No. 16 AWG. Compatible with manufacturers requirement

PART 3 - EXECUTION

3.01 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.02 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.03 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch (13 mm).

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.04 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
   1. Identify controlled circuits in lighting contactors.
   2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.05 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.06 ADJUSTING

A. Occupancy Adjustments: When requested within 3 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
   1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
   2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
   3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.07 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems specified in Section 260943.13

"Addressable-Fixture Lighting Controls" and Section 260943.23 "Relay-Based Lighting Controls."

B. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

SECTION 26 09 23.1

LIGHTING CONTROL RELAY PANEL

PART 1 - GENERAL

1.01 INTRODUCTION

A. The work covered in this section is subject to all of the requirements in the General Conditions of the specifications. Contractor shall coordinate all of the work in this section with all the trades covered in the other sections of the specification to provide a complete and operative system.

1.02 DESCRIPTION OF WORK

A. Extent of lighting control system work is indicated by drawings, and by the requirements of this section. It is defined to include low voltage lighting control panels, switch inputs, and wiring.

B. Type of lighting control equipment and wiring specified in this section include the following:
   1. Low Voltage Lighting Control Panels

1.03 QUALITY ASSURANCE

A. UL & ULc Approvals:
   1. The control panels shall be tested and listed under the UL 916 Energy Management Equipment standard and CSA C22.2 #205 by a nationally recognized testing laboratory.

B. NEC Compliance:
   1. The control system shall comply with all applicable National Electrical Codes regarding electrical wiring standards.

C. NEMA Compliance:
   1. The control system shall comply with all applicable portions of the NEMA standards regarding the types of electrical equipment enclosures.

D. Component Pre-testing:
   1. All control equipment shall undergo strict inspection standards. The equipment shall be previously tested and burned-in at the factory prior to installation.

E. System Checkout:
   1. A factory trained technician or factory authorized personnel or contractor shall functionally test the control system and verify performance after installation.

1.04 SUBMITTALS

A. Product Data:
   1. Submit manufacturer's data on lighting control system and components.

B. Shop Drawings:
   1. Submit drawings of lighting control panel and accessories including, but not necessarily limited to the low voltage relay panels, power wiring, and switch inputs.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. SYSTEM DESCRIPTION:
   1. The lighting control system shall consist of low voltage relay control panels with 64 programmable switch inputs and shall offer up to 32 control relays, refer to panelboard schedules for numbers required.
   2. Each low voltage lighting control panel shall be microprocessor controlled. Programming shall be accomplished through either the RS-232 port or through the network connection employing the Keeper Enterprise software or with an integral 4 x 16 – 64 character self-prompting LCD display and programming keypad.
   3. Programmable intelligence shall include Time-Of-Day control, 32 holiday dates, warn occupants of an impending off, timed inputs, preset control, auto daylight savings, astronomical clock w/offsets, and local control, digital switches and network overrides.

TOD	64 Time-Of-Day/holiday schedules for 365 day programming
Holidays	32 holiday dates
Warn Off	Flash lights and provide an extra 1 second to 99 minutes of illumination
Preset	Pre-programmed switch patterns
Timed Inputs	Switch input timers 1-999 minutes
Timed Overrides	Timed override 1-999 minutes, resumes to normal schedule
Local Control	From keypad & LCD display or local switch
Astronomical Clock	Longitude and latitude input with sunset-sunrise offsets to customize outdoor lighting
Auto Daylight Savings Adjust.	Automatically adjusts the clock at the appropriate dates, selectable
Priorities	Establishes a hierarchy for inputs and network control commands
Masking	Provides permission orientation to switch inputs and network commands thereby ensuring building lighting control integrity.
Soft-Linking	Group linking for rapid programming
Global Linking	Each panel shall provide 64 addressable groups for network linking of control commands

4. Relays may be designated as either normally open or normally closed from the software. Relay status shall not only disclose commanded relay status but next scheduled state to occur.
5. Each control panel shall provide a Warn Off (flash the lights) to inform the occupants of an impending Off command. The Warn Off command shall provide an adjustable time duration of 1 second to 99 extra minutes. The occupants may exit the premises with adequate lighting or cancel the Warn Off by overriding the lighting zone. This option occurs with all Off commands except local overrides.
6. The controller shall permit lighting to be overridden On for after hours use or cleaning. The controller shall provide optional switch timer assignments or timed overrides. The override choices for various relays shall provide special event occurrences and the controller shall return to the programmed state after the override event. Also, the controller shall provide priority and masking choices to customize the functions of switch inputs, thereby enabling switches to function differently at different times of the day to meet special facility operational requirements. These overrides shall be digital, or hard-wired inputs.
7. Programming the controller shall be through the RS-232 port or through the network connection. Communication to the panel can be accomplished via, RS-232, modem, or TCP/IP. Programming the controller shall also be accomplished through the integral keypad and LCD display. Descriptive information shall assist the user to employ the system with a programming manual. Lighting control systems that utilize removable programming keypads shall not be acceptable.
8. Priorities and/or Masking shall be assigned to inputs, telephone override, and global commands to insure building integrity. Priorities enable or disable the inputs based on user actuation of overrides. Masks shall permit: On only, Off only and On & Off control for intelligent after hours utilization of the controlled facility based on Time-Of-Day scheduling in the controller.

9. The lighting control system shall log all control events. The controller shall monitor all relay actuations, switch inputs and user intervention. Log reports shall be available for any duration of time the operator chooses through the Keeper Enterprise Software. Runtimes for each relay shall be available from the Keeper Enterprise Software.
10. (Optional) The lighting control system shall permit LED annunciated digital switches. Each digital switch shall provide status feedback of any control relay in the lighting control panel.

B. HARDWARE FEATURES:
1. Diagnostic Aids:
   a. Each control panel shall incorporate diagnostic aids for confirmation of proper operation, or in case of failure these aids shall guide the individual in rapid troubleshooting of the system.
   b. The control panels shall employ both a backlit LCD and LED's to indicate:
      1) POWER (LED)
      2) SYSTEM OK (LED)
      3) ON/OFF STATUS of EACH RELAY (LED & LCD)
      4) SYSTEM CLOCK AND DATE (LCD)
      5) PROGRAMMING CONFIRMATION (LCD)
   c. Control systems that do not provide visual self-help diagnostics shall not be acceptable.
      1) Status Indication of Relays:
         a) The system shall provide visible status indication of all relays through the window of each control panel. The visual indication shall disclose On/Off status and relay number. Systems that do not provide relay status while the enclosure door is closed shall not be acceptable.
2. Operator Interface:
   a. The control panel programming interface resides in firmware in the control panel. The programming interface shall consist of a circuit board mounted keypad and 4 line x 16 character LCD display. The integral keypad shall provide access to the main programming features. The keypad shall permit the user to manually command any or all relays individually. It shall also allow the user to link switch inputs and time schedules to relay outputs. Each panel shall control its own loads from internal memory. A control system that relies on a central control computer/processor or external time clocks shall not be permitted. Systems that utilize blocking diode technology for relay assignments shall not be acceptable.
3. Overrides:
   a. The controller shall provide timers for each override. Each override timer shall be capable of 0-999 minutes. Software shall enable or disable overrides based on Priorities, Masks or Time Of Day scheduling.
      1) Digital Switch (Digita™):
         a) The lighting controller shall support digitally addressable LED annunciated switches. The maximum total number of digital switches that may exist on the lighting control network is 16,320. Each Subnet shall support 64 buttons. The digital switch network requires CAT 5 cable between switches. The digital switches shall control any relay group combination in the panel. Data communications status feedback for system checkout and troubleshooting (transmit and receive —> LED'S) shall be visible on both the controller and interface.
         b) The digital switch configuration system shall permit custom labeling for multiple button switch locations. The digital switch configuration shall be Decora® form and function.
      2) Dry Contact Inputs:
         a) The control system shall permit 32 dry contacts inputs for override purposes. Momentary 3 wire or 2 wire (toggle) inputs shall be supported. Maintained contacts shall be supported as 2 wire (SPST) inputs. Inputs shall be dry

contacts (24 VDC @ 12 ma. internally supplied to the inputs). The 24 VDC power supply is provided with an auto-resettable fuse. Should an inappropriate electrical connection be made the design will protect the board and switches until the fault is removed. Any switch input shall be software linked to any number of relays for override control. The control panel shall have dry contact inputs on the logic board. Control systems that utilize separate accessories to allow for dry contact switches shall not be acceptable. Control systems that do not supply both digital switches and analog switches from the same controller shall not be permitted.

3) Photocell Control:
   a) The controller shall accept dry contact ambient light sensors. The controller shall provide power for the sensor thereby eliminating any external power supply. Sensors shall provide for outdoor and indoor applications and issue a command to the controller once the threshold is reached. The sensor shall provide user adjustable dead band control.
4) Remote Overrides:
   a) The controller shall accept remote commands issued from other inputs. The controller shall provide this feature without the need to add extra equipment to the controller. Remote overrides can be issued from the Telephone Interface Module (TIM), Photocells, Motion Sensors, Digital or Dry Contact Switches. Lighting systems that need to add extra equipment to receive remote overrides are not acceptable.

4. Service Override & Priority Override:
   a. The control panel shall provide a three position master-service override for the control unit. The service override shall not be accessible from the exterior. Systems that provide a service override on the exterior of the controller shall not be acceptable.
   b. The master service override provides a single three-position switch with the option of All Off, Auto, and All On, respectively. This master switch shall operate all of the relays in the controller. This switch shall override and supersede all commands from the logic board when the switch is in the All On or All Off position. The master switch shall function to override all the relays should the logic board programming differ from the space function.
   c. The system shall remember the last command to the individual relays. Upon returning the master override switch to the Auto position, the relays shall return to the most recent command state. This will occur even if the last command happened during the master override condition.
5. Relays:
   a. The LiteKeeper® comes standard with electrically held 20amp 120/277VAC relays. Relays must be specified Normally Open or Normally Closed. The relays shall be rated for 10 million mechanical operations.
      1) Modular Relay Card (MRC):
         a) The controller shall provide an option for modular relay control. The Modular Relay Card (MRC) shall offer the feature of controlling two pole voltages such as 208, 240, and 480VAC in a Normally Open or Normally Closed configuration. Single pole is offered for 120 and 277VAC in a Normally Open and Absolute Zero Configuration. This relay card shall also provide visual indication of relay status. The wire terminations shall be able to accept 10 AWG for single pole relays and 6AWG for two pole relays. Relays shall be individually exchangeable with plug in low voltage connectors. Combinations of relays shall be permitted since relay modules shall snap into and lock in location. Two pole modules require two relay locations for a maximum of four two pole relays per card. All other relay modules use 1 relay location for

a maximum of eight per card. All Modular Relay Card components shall be warranted for 10 years.

6. RS-232 port:
   a. The controller shall provide an RJ-12 connection for RS-232 communications. Programming shall be permitted through either a local connection or remotely through a modem. The Keeper Enterprise software accessory includes a six wire communication cable to connect to the controller. Systems that do not include an on-board RS-232 port for communications are not acceptable.
7. Modular Design:
   a. The control system shall employ all modular connectors to avoid repeat wiring in case of component failure. The system CPU board shall be on quick release hinge pins that shall permit an entire change out of the processor and input board in less than 1 minute.
   b. All connections for the switch inputs shall incorporate modular connectors. The relay board shall be modular and designed for rapid field replacement or upgrading. Systems that do not employ modular connectors shall not be acceptable.
8. Memory Back-up:
   a. The system shall utilize a memory back-up device that is system integrated and shall be non-serviceable. The data in RAM shall be protected against power interruptions lasting as long as 7 days. The power interrupt protection circuit shall be entirely maintenance-free.
9. Multi-tapped Transformer:
   a. The control panel shall incorporate the use of a multi-tapped transformer. The panel shall not require specification of voltage for each control location. The voltages of 120 & 277 VAC shall be available with each control panel.
10. Lockable Enclosure:
    a. Each control panel shall be enclosed in a lockable NEMA class 1 enclosure. The enclosure shall be manufactured out of 1/16” steel and shall provide pre-punched knockouts for efficient installation.
11. The low voltage controller shall exist in two sizes of relay enclosures. The enclosure maximum sizes shall be either 16 or 32 relays per cabinet. The 16 size will employ two relays cards and the 32 will utilize 4 relay cards. Relays shall be provided in groups of eight relays per card.
12. Keeper Enterprise Software:
    a. The PC based interface software accessory provides access to lighting control system files within a Microsoft® Windows® environment. The Keeper Enterprise software shall support Windows® 2000, Windows® XP and above. The optional software package shall allow individual panel programming to be executed locally, via direct connection or remotely through a TCP/IP connection or modem. The central programming software shall permit the user to modify the control panel programming or configuration in an “OFF-LINE” mode. This software package shall store all programmed data and archive for future use. Systems using third party software are not acceptable. Systems that are not capable of creating program backups are not acceptable.
    b. The following features shall be standard in the PC based software:
       1) Standard Software Features:
          a) Real Time Relay Status Monitoring
          b) Alpha-Numeric Descriptors
          c) Communications: Direct, TCP/IP and Modem
          d) Status Indication
          e) Global Software Modifications
          f) Manual Relay Commands
          g) Relay Pattern Commands
          h) Preset Options

i) User Management – Password protection, and privilege modification for multi-user security.
j) Logging of Controller Actions (switch inputs, TIM commands, & relay actuations)

2) File Maintenance:
a) Archive Programs
b) Data Base Restoration
c) Uploading and Downloading of Programs
d) Snap Shots — indication of changes and flawless panel restoration.

3) Software package shall permit the PC to be utilized for other functions (i.e. word processing, database, & etc..) besides lighting control. Systems that require an "on-line" dedicated computer for control system operation shall not be acceptable.

13. Stand Alone Hardware Accessories:
a. Ethernet Interface Module (EIM):
1) Internet Connection Specifications: The control system accessory provides easy access to control panels over a TCP/IP connection by converting sent information into RS-232 communication capable information. This unit operates on standard 110VAC. Manufacturer shall provide proper cabling from controller to Ethernet Interface Modules. RJ-45 connections are the responsibilities of others.
2) This specification will outline the respective responsibilities of Cooper Controls and of the customer when a TCP/IP connection is used for communication to the Cooper Controls network.
a) Cooper Controls Responsibility to the Customer: Cooper Controls will supply one Ethernet Interface Module per network when a TCP/IP connection is used. Instructions on how to install and configure the Ethernet Interface Module shall be supplied by Cooper Controls.
b) Customer's Responsibility: The customer will provide an IP address, Subnet Mask, Default Gateway, and a TCP Port Number for each Ethernet Interface Module required. The customer shall provide a qualified Network Administrator to properly configure the device(s). Any future changes to the customers TCP/IP network that affect the operation of the device(s) will be the customer's responsibility.The customer will be responsible for any Internet and Virus Protection Security measures. This includes, but is not limited to, Firewall, Proxy Servers, and Virus Protection Software. The customer will provide a qualified Technician to install and connect the Ethernet Interface Module to the building's LAN and to the Cooper Controls lighting panel. The Ethernet wire should be Category 5 wire and installed per Category 5 wiring specifications.

C. ACCEPTABLE PRODUCTS:
1. LiteKeeper® lighting control unit manufactured by Cooper Controls, 6 Green Tree Drive, So. Burlington, VT 05403-6025 or engineer approved equal.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION AND DOCUMENTATION

A. Installation:

B. The control system shall be installed and fully wired as shown on the plans by the installing contractor. The contractor shall complete all electrical connections to all control circuits, and override wiring.

C. Documentation:

1. The contractor shall provide accurate “as-built” drawings to the owner for correct programming and proper maintenance of the control system. The “as-builts” shall indicate the load controlled by each relay and the relay panel number.

D. Operation and Service Manuals:
   1. The factory shall supply all operation and service manuals.

3.02 PRODUCT SUPPORT AND SERVICE

A. Factory Support:
   1. Factory telephone support shall be available at no cost to the owner. Factory assistance shall consist of solving programming or application questions concerning the control equipment.

3.03 SYSTEM DELIVERY AND ACCEPTANCE

A. Delivery:
   1. The contractor is responsible for complete installation of the entire system according to strict factory standards and requirements. The following items shall constitute factory standards and requirements:
      a. All system equipment shall operate in accordance with specification and industrial standard procedures.
      b. An operational user program shall exist in the control system. The program shall execute and perform all functions required to effectively operate the site according to the requirements.
      c. Demonstration of program integrity during normal operation and pursuant to a power outage.
      d. Contractor shall provide a minimum of two training hours on the operation and use of the control system. Additional support services shall be negotiated between the contractor and the building owner or manager.

3.04 WARRANTY

A. Warranty:
   1. Manufacturer shall supply a 3-year warranty on all hardware and software. A limited 10-year warranty shall be provided on all relay cards. These warranties will be in affect for all installations. Systems that provide special warranties based on installation shall not be acceptable.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Panelboards.
   2. Lighting and appliance branch-circuit panelboards.
   3. Load Centers

1.03 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. HID: High-intensity discharge.

E. MCCB: Molded-case circuit breaker.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.
   1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
   2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Keys: Two spares for each type of panelboard cabinet lock.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

1.08 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
   1. Panelboard Warranty Period: 12 months from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.
   1. SPD Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANELBOARDS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces at project location.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Enclosures: Flush and Surface-mounted, dead-front cabinets.
   1. Rated for environmental conditions at installed location.
      a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
      b. Outdoor Locations: NEMA 250, Type 3R.
      c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
      d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
      e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
   2. Height: 84 inches (2.13 m) maximum.
   3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
   4. Finishes:
      a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
      b. Back Boxes: Galvanized steel.

G. Incoming Mains:
   1. Location: Top or Bottom per installation requirements.
   2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

H. Phase, Neutral, and Ground Buses:
   1. Material: Hard-drawn copper, 98 percent conductivity.
   a. Bus shall be fully rated the entire length.
   2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
   3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
   4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
   5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

I. Conductor Connectors: Suitable for use with conductor material and sizes.
   1. Material: Hard-drawn copper, 98 percent conductivity.
   2. Terminations shall allow use of 75 deg C rated conductors without derating.
   3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
   4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
   5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
   6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
   7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

J. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment where noted on drawing or required by code with one or more main service disconnecting and overcurrent protective devices.

K. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
   1. Percentage of Future Space Capacity: 20 percent minimum include spaces and spares as noted on drawing.

L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity. Series rated not allowed.

2.02 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 current edition.

2.03 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. Siemens Energy.
   3. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, distribution type. All panels inside of individual townhouses or apartments shall be load centers of 120/208/1 or 120/240/1 voltage see drawings.

C. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.
   1. Doors: Concealed hinges secured with multipoint latch with tumbler lock; keyed alike.

D. Mains: Circuit breaker or Lugs only as noted on drawing.

E. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

F. Contactors in Main Bus: NEMA ICS 2, Class A, electrically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
   1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
   2. External Control-Power Source: as required.

2.04 OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. Siemens Energy.
   3. Square D; by Schneider Electric.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers:
      a. Inverse time-current element for low-level overloads.
      b. Instantaneous magnetic trip element for short circuits.
      c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
   3. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
   4. Subfeed Circuit Breakers: Vertically mounted.
   5. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
g. Shunt Trip: Voltage as required trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

6. All branch breakers located in load centers fo the town houses or apartments shall be are-fault breakers. See panel schedules for breakers requiring ground fault circuit interrupt too.

2.05 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.
1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.06 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NEMA PB 1.1.

D. Equipment Mounting:
1. Install floor mounted panelboards on cast-in-place concrete equipment base(s) nominal 4”. Concrete compressive strength equal to floor concrete.

2. Attach panelboard to the vertical finished or structural surface behind the panelboard. Provide support backing for gypsum board walls.

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Mount top of trim 72 inches above finished floor unless otherwise indicated.

G. Mount panelboard cabinet plumb and rigid without distortion of box.

H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

I. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection. Mount panelboards to steel slotted supports 5/8 inch (16 mm) in depth. Orient steel slotted supports vertically.

J. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.
   2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

K. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

L. Install filler plates in unused spaces.

M. Stub four 1-inch (27-EMT) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-EMT) empty conduits into raised floor space or below slab not on grade.

N. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

O. Mount spare fuse cabinet in accessible location.

3.03 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a black with white lettering laminated nameplate.

D. Device Nameplates: Label each branch circuit device in power panelboards with a black with white lettering laminated nameplate.

E. Install warning signs complying with requirements in National Electrical Code and local codes.

3.04 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NEMA PB 1.1-2013, “General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less” prior to energizing.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Panelboards will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform.

1. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Owner. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.06 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Receptacles, receptacles with integral GFCI, and associated device plates.
   2. Receptacles with integral surge-suppression units.
   3. Tamper-resistant receptacles.
   4. Weather-resistant receptacles.
   5. Snap switches and wall-box dimmers.
   6. Wall-switch.

1.03 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

C. TVSS: Transient voltage surge suppressor.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
   2. Cord and Plug Sets: Match equipment requirements.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.06 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.08 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. TVSS Receptacles: One for every 25 of each type installed, but no fewer than two of each type.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton (Arrow Hart).
   2. Hubbell Incorporated; Wiring Device-Kellems.
   3. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.02 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. All wiring devices shall be minimum specification grade. Commercial grade not allowed.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with the requirements in this Section.

2.03 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596. All wiring devices shall be minimum commercial grade. Receptacles in "Tamper-Resistant Convenience Receptacles, 125 V, 20 A" Paragraph below are for installation in pediatric-care locations.

B. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement SD, and FS W-C-596. All wiring devices shall be minimum commercial grade.

2.04 GFCI RECEPTACLES

A. General Description:
   1. Straight blade, non-feed-through type.
   2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596. All wiring devices shall be minimum specification grade. Commercial grade not allowed.
   3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
   4. Receptacles in damp and wet locations shall be UL 498SE Weather Resistant compliant.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A. Receptacles in damp and wet locations shall be UL 498SE Weather Resistant compliant.

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A. Receptacles in damp and wet locations shall be UL 498SE Weather Resistant compliant.

2.05 TVSS RECEPTACLES

A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 1449, and FS W-C-596, with integral TVSS in line to ground, line to neutral, and neutral to ground. All wiring devices shall be minimum specification grade. Commercial grade not allowed.
   1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
   2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

B. Duplex TVSS Convenience Receptacles:
   1. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.

2.06 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896. All wiring devices shall be minimum commercial grade.

B. Switches, 120/277 V, 20 A:
   1. Single Pole.
   2. Two Pole.
   3. Three Way.
   4. Four Way:

2.07 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
   3. Material for Unfinished Spaces: Galvanized steel.
   4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with UL 514D-2000 “Weatherproof In-Use ‘Extra-Duty’”Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.08 FINISHES

A. Device Color:
   1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
   2. Wiring Devices Connected to Emergency Power System: Red.
   3. TVSS Devices: Blue.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
   1. **Replace** devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:
1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.02 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.03 IDENTIFICATION

A. Comply with Section "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.04 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Ground Impedance: Values of up to 2 ohms are acceptable.
3. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
4. Using the test plug, verify that the device and its outlet box are securely mounted.
5. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Test straight-blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Cartridge fuses **rated 600 V and less for use in switches.**

1.03 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:
   1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
   2. Let-through current curves for fuses with current-limiting characteristics.
   3. Time-current curves, coordination charts and tables, and related data.
   4. Fuse size for elevator feeders and elevator disconnect switches.

B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
   1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
   2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA FU 1.

D. Comply with NFPA 70.

1.05 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.06 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: Quantity equal to 10 percent of each fuse type and size, but no fewer than three of each type and size.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Bussman, Inc.
   2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
   3. Ferraz Shawmut, Inc.
   4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.02 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

2.03 SPARE-FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
   1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
   2. Finish: Gray, baked enamel.
   3. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
   4. Fuse Pullers: For each size of fuse.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FUSE APPLICATIONS

A. Service Entrance: Class L, time delay RK1, time delay or J, time delay. Voltage rating consistent with circuit voltage.

B. Feeders: Class L, time delay RK1, time delay J, time delay or RK5, time delay. Voltage rating consistent with circuit voltage.

C. Motor Branch Circuits: Class RK1 or RK5, time delay. Voltage rating consistent with circuit voltage.

D. Other Branch Circuits: Class RK1, time delay, RK5, time delay or J, time delay. Voltage rating consistent with circuit voltage.

3.03 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.04 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION

SECTION 26 32 13

GENERATOR

PART 1 - GENERAL

1.01 SUMMARY

A This section includes the following items from a single supplier:
1. Engine Generator Set.
2. Enclosure.
3. Related Accessories as specified.

B Related Requirements.
1. It is the intent of this specification to secure an engine-driven generator set that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.
2. Any exceptions to the published specifications shall be subject to the approval of the engineer and submitted minimum 10 days prior to the closing of the bid with a line by line summary description of all the items of compliance, any items that have been are omitted or have been taken exception to, and a complete description of all deviations.
3. It is the intent of this specification to secure a generator set system that has been tested during design verification, in production, and at the final job site. The generator set will be a commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.
4. All equipment shall be new and of current production by an international, power system manufacturer of generators, transfer switches, and paralleling switchgear. The manufacturer shall be a supplier of a complete and coordinated system. There will be single-source responsibility for warranty, parts, and service through a factory-authorized representative with factory-trained technicians.
5. The generator size shall be bid as specified. However, prior to purchasing or submitting shop drawings the generator provider must review the electrical information provided with the elevator shop drawings and verify that the generator will provide the necessary power to operate the elevator. Failure to do so will require the contractor and generator supplier to provide all necessary product, material and labor to correct the generator size at no additional cost to the project.

1.02 SUBMITTALS

A Action Submittals
1. Product Data
   a The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.

B Informational Submittal
1. Certificates
   a The generator set shall be listed to UL 2200 or submitted to an independent third party certification process to verify compliance as installed.
2. Test and Evaluation Reports
3. Manufacturer’s Instruction
4. Source Quality Control Submittals
5. Field or Site Quality Control
6. Manufacturer’s Report
7. Special Procedure Submittal

8. Qualification Statement

C Closeout Submittal
1. Maintenance Contracts
2. Operation And Maintenance Data
3. Bonds
4. Warranty Documentation
5. Record Documentation
6. Software

D Maintenance Material Submittals

1.03 QUALITY ASSURANCE

A Regulatory Agency
1. The generator set shall conform to the requirements of the following codes and standards:
   a CSA C22.2, No. 14-M91 Industrial Control Equipment.
   b EN50082-2, Electromagnetic Compatibility-Generic Immunity Requirements, Part 2: Industrial.
   c EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
   d IEC8528 part 4, Control Systems for Generator Sets.
   e IEC Std 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and conducted electromagnetic emissions.
   f IEEE446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
   g NFPA 70, National Electrical Code, Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
   h NFPA 110, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit. Component level type tests will not substitute for this requirement.
2. Qualifications
   a The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
   b The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.
3. Manufacturers
   a The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.

1.04 FIELD OR SITE CONDITIONS

A Ambient Conditions
1. Engine- generator set shall operate in the following conditions without any damage to the unit or its loads.
   a Ambient Temperature: 100 °F
   b Altitude : 807 ft
   c Relative Humidity: 95%

1.05 WARRANTY OR BOND

A Manufacturer’s Warranty
1. The generator set shall include a standard warranty covering one (1) year or 2000 hours, whichever occurs first, to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from the date of initial startup.

2. The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

PART 2 PRODUCT

2.1 EQUIPMENT

A Equipment

1. The generator set shall be a Caterpillar C4.4 Generator set. It shall provide 50eKW when operating at 120/208 volts, 60 Hz, 0.80 power factor. The generator set shall be capable of a 130°C Standby rating while operating in an ambient condition of less than or equal to 100 °F and a maximum elevation of 1100 ft above sea level. The standby rating shall be available for the duration of the outage.

B Engine

1. C4.4, in-line 4, 4-cycle, turbocharged diesel engine
2. The engine shall be EPA certified from the factory
3. The generator must accept rated load in one-step.

C Cooling System

1. The engine shall be liquid-cooled by a closed loop, unit mounted radiator rated to operate the generator set at full load at an ambient temperature of 50 degrees C (122 degrees F). The radiator fan and other rotating engine parts shall be guarded against accidental contact.

D Standard Air Cleaner

1. The air cleaner shall provide engine air filtration which meets the engine manufacturer's specifications under typical operating conditions.

E Battery

1. Each genset requires a maintenance free BCI group 24 battery which must meet the engine manufactures' specifications for the ambient conditions specified in Part 1 Project Conditions and shall comply with the NFPA requirements for engine cranking cycles. This battery shall be rated according to SAE Standards J-537 with a minimum cold cranking amp of 650 amps and a minimum reserve capacity of 120 Minutes at 80F. The battery plates shall be constructed of a Calcium-Lead alloy to provide long waterless operation and extended battery life. The battery must contain a handle to aid in lifting and the case must be constructed of polypropylene to resist breakage and extend service life.
2. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

F Housing

1. Weather Enclosure
   a. The generator set enclosure shall be a factory assembled package constructed from a minimum of high strength, low alloy 16 gauge steel with polyester powder coating. The enclosure shall have a pitched enclosure roof to prevent water accumulation, and a radiator fill panel to provide easy service access to the radiator. The enclosure shall be manufactured from bolted panels to facilitate service, future modifications, or field replacement.
   b. The enclosure must surpass a 3,000 hour salt spray corrosion test per ASTM B-1117.
   c. Enclosures will be finished in the manufacturer's standard color.
   d. The enclosures shall allow the generator set to operate at full load in an ambient temperature of 40 - 50°C with no additional derating of the electrical output of the generator set.
   e. Enclosures shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements

are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker shall meet the requirements of the National Electric Code.

g. Doors shall be hinged with stainless steel lift off hinges, and hardware, and the doors shall be removable. Access doors shall be rubber sealed to prevent water intrusion and to minimize noise.

h. Doors shall be equipped with lockable latches. Locks shall be keyed alike. Door locks shall be recessed to minimize potential of damage to door/enclosure.

i. A duct between the radiator and air outlet shall be provided to prevent re-circulation of hot air.

j. The complete exhaust system shall be internal to the enclosure.

k. The critical silencer shall be fitted with a tailpipe and rain cap.

l. Furnish with 134 gallon integral/sub-base fuel tank.

G Controller

1. System Controller Monitoring and Status Features and Functions

a. The generator controller shall display and monitor the following engine and alternator functions and allow adjustments of certain parameters at the controller:

1) Overview menu

a) Active shutdowns and warnings shall be displayed if present and without the need of operator interface

b) Engine runtime with total hours

c) Average line to line voltage

d) Coolant temperature

e) Fuel level or pressure

f) Oil pressure

g) Battery voltage

h) Software version

i) Frequency

j) Average current

2) Engine metering menu.

a) Engine speed

b) Oil pressure

c) Coolant temperature

d) Battery voltage

3) Generator metering menu.

a) Total power in VA

b) Total power in W

c) Rated power % used

d) Voltage L-L and L-N for all phases

e) Current L1, L2, L3

f) Frequency

4) Generator set information.

a) Generator set model number

b) Generator set serial number

c) Controller set number

5) Generator set run time.

a) Engine run time total hours

b) Engine loaded total hours

c) Number of engine starts

d) Total energy in kW

6) Generator set system

a) System voltage

b) System frequency 50/60Hz

c) System phase, single/three phase
d) Power rating kW
e) Amperage rating
f) Power type standby/prime
g) Measurement units, metric/English units adjustable
h) Alarm silence, always or auto only

7) Generator set calibration, the following are adjustable at the controller.
a) Voltage L-L and L-N all phases
b) Current L1, L2, L3
c) Reset all calibrations

8) Voltage regulation, +/-0.5% regulation, the following is adjustable at the controller.
a) Voltage Adjustable +/- 10%

9) Digital and Analog Inputs and outputs
a) Displays settings and status

10) Event Log
a) Stores event history, up to 1000 events

2. Controller Engine control features and functions
   a. Automatic restart - the controller has automatic restart feature that initiates the start routine and re-crank after a failed start attempt.
   b. Cyclic cranking - the controller shall have programmable cyclic cranking
   c. Engine starting aid - the controller shall have the capability of providing control for an optional engine starting aid.
   d. The control system shall include time delays for engine start and cool down.
   e. The control system shall interface with the engine ECM and display engine fault codes and warnings. The ECM shall also include sender failure monitoring to help distinguish between failed senders and actual failure conditions.
   f. The controller shall monitor and display engine governor functions with include steady state and transient frequency monitoring
3. Controller Alternator control features and functions
   a. Integrated hybrid voltage regulator. The system shall have integral microprocessor based voltage regulator system that provides +/- 5% voltage regulation, no-load to full load with three phase sensing. The system is prototype tested and control variation of voltage to frequency. The voltage regulator shall be adjustable at the controller with maximum +/- 10% adjustable of nominal voltage.
   b. AC output voltage regulator adjustment. The system shall allow for adjustment of the integral voltage regulator with maximum of +/- 10% adjustment of the system voltage.
   c. Alternator thermal overload protection. The system shall have integral alternator overload and short circuit protection matched to each alternator for the particular voltage and phase configuration.
   d. Power metering. The controller digitally displays power metering of kW and kVA.
4. Other control features and functions
   a. Event logging. The controller keeps a record of up to 1000 events, for warning and shutdown faults. This fault information becomes a stored record of systems events and can be reset.
   b. Historical data logging. The controller total number of generator set successful start shall be recorded and displayed.
   c. Programmable access. The control system shall include a USB port that gives service technicians the ability to provide software and firmware upgrades. The system shall also be capable of allowing setting of all critical parameters using the service software and a laptop computer. All parameters and setting should be capable to being stored on a laptop for future upgrades of printing for

analysis.

5. Generator Set Warning, Shutdown Alarm and Status
   a. The generator set shall have alarms and status indication lamps that show non-automatic status and warning and shutdown conditions. The controller shall indicate with a warning lamp and or alarm and on the digital display screen any shutdown, warning or engine fault condition that exists in the generator set system. The following alarms and shutdowns shall exist as a minimum:
      1) Engine functions
         a) Critical high fuel level (alarm)
         b) ECM communication loss (shutdown)
         c) ECM diagnostics (alarm & shutdown)
         d) Engine overspeed (shutdown)
         e) Engine start aid active
         f) Engine under speed (shutdown)
         g) Fuel tank leak (alarm & shutdown)
         h) High DC battery voltage (alarm)
         i) High coolant temperature (alarm & shutdown)
         j) High fuel level (alarm)
         k) Low DC battery voltage (alarm)
         l) Low coolant level (shutdown)
         m) Low coolant temperature (alarm)
         n) Low cranking voltage (alarm)
         o) Low engine oil level (alarm & shutdown)
         p) Low fuel level (alarm & shutdown)
         q) Low fuel pressure (alarm)
         r) Low oil pressure (alarm & shutdown)
         s) No coolant temperature signal (shutdown)
         t) No oil pressure signal (shutdown)
         u) Overcrank (shutdown)
         v) Speed sensor fault (alarm)
      2) Generator functions
         a) AC sensing loss over & under current (alarm & shutdown)
         b) Alternator protection (shutdown)
         c) Ground fault input (alarm)
         d) kW overload (shutdown)
         e) Locked rotor (shutdown)
         f) Over-frequency (shutdown)
         g) Over AC voltage (shutdown)
         h) Under-frequency (shutdown)
         i) Under AC voltage (shutdown)
         j) Emergency stop (shutdown)
      3) Other General functions
         a) Battery charger fault (alarm)
         b) Common fault (shutdown)
         c) Common warning (alarm)
         d) Master switch not in auto (alarm)
         e) Generator running
         f) Input/Output fault (alarm)
      4) The generator set controller shall also be capable of meeting all necessary NFPA 110 level 1 requirements that include several of the above along with; EPS supplying load, Master switch “not in auto”, and contacts for local and remote common alarm.
6. Communications
   a. If the generator set engine is equipped with an ECM (engine control module),

the controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1939 standards

b. Kohler proprietary RBUS communication shall be available.
c. A RBUS shall be able to monitor and alter parameters, and start or stop a generator.
d. The controller shall have the capability to communicate to a personal computer (IBM or compatible) and appropriate application software
e. A variety of connections shall be available based on requirements:
   1) A single control connection to a PC via USB
   2) Internet connection via Ethernet
f. Generator and transfer switch controls shall be equipped with communications modules capable of connecting to the same communication network.

H Generator Overcurrent and Fault Protection

1. The generator shall be provided with a factory installed, 100% rated line circuit breaker rated at 175 amperes that is UL489 listed. Line circuit breakers shall be sized for the rated ampacity of the loads served by the breaker per the NEC.
2. The circuit breaker(s) shall incorporate an electronic trip device with the following characteristics:
3. Adjustable long time delay
4. Adjustable short time delay *[As applicable]*
5. Instantaneous
6. Load side lugs shall be provided from the factory. The line circuit breaker shall include auxiliary contacts, shunt trip, undervoltage trip, alarm switch, and overcurrent switch functionality. Load side breaker connections made at the factory shall be separated from field connections.
7. The shunt trip device shall be connected to trip the generator breaker when the generator-set is shut down by other protective devices.
8. When GFI is required per the NEC, additional neutrals shall be factory installed, and the alarm indication shall be integrated with the generator-set alarms.
9. Barriers to provide segregation of wiring from an emergency source to emergency loads from all other wiring and equipment, if required by the NEC, shall be provided.

I Vibration Isolation

1. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

2.2 ACCESSORIES

A. The generator set shall be supplied with a 10-ampere automatic float/equalize battery charger capable of charging both lead-acid and ni-cad type batteries.

B. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied

C. The generator shall be furnished with an externally mounted, recessed, emergency stop switch (break glass, pushbutton style) protected from accidental operation.

D. Block Heater - The block heater shall be thermostatically controlled, 1,500 watt, 110-120 VAC - single phase, to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 99 and NFPA 110, Level 1.

E. The exhaust piping shall be gas proof, seamless, stainless steel, flexible exhaust bellows and includes the flex exhaust tube and the mounting hardware.

F. The generator set shall be supplied with a means to manually adjust the speed of the generator.

G. Remote annunciator panel – The remote annunciator shall meet NFPA 110, Level 1 requirements and enable remote viewing of the generator status. The panel shall be connected to the generator controller via either network communication wires or via hard wired connections. Options shall be available to provide ATS source availability, contactor position, and loaded or unloaded test

for up to four transfer switches. The panel shall have the capability to be either flush- mounted or surface-mounted. The annunciator shall meet UL508 requirements.

2.3 SOURCE QUALITY CONTROL

A. Non-Conforming Work

1. To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.
   a. **Design Prototype Tests.** Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:
      1) Maximum power (kW)
      2) Maximum motor starting (kVA) at 35% instantaneous voltage dip.
      3) Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.
      4) Governor speed regulation under steady-state and transient conditions.
      5) Voltage regulation and generator transient response.
      6) Harmonic analysis, voltage waveform deviation, and telephone influence factor.
      7) Three-phase short circuit tests.
      8) Alternator cooling air flow.
      9) Torsional analysis to verify that the generator set is free of harmful torsional stresses.
      10) Endurance testing.
   b. **Final Production Tests.** Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
      1) Single-step load pickup
      2) Safety shutdown device testing
      3) Rated Power @ 0.8 PF
      4) Maximum power
      5) Upon request, a witness test, or a certified test record sent prior to shipment.
   c. **Site Tests.** The manufacturer's distribution representative shall perform an installation check, startup, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
      1) Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
      2) Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.
      3) Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.
      4) Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

END OF SECTION

SECTION 26 32 14

AUTOMATIC TRANSFER SWITCHES

Two 60 amp, automatic transfer switches

PART 1 - GENERAL

1.01 SCOPE

A. Furnish and install automatic transfer switches with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. Each automatic transfer shall consist of an inherently double throw power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. All transfer switches and control panels shall be the product of the same manufacturer.

1.02 CODES AND STANDARDS

A. The automatic transfer switches and accessories shall conform to the requirements of:
   1. UL 1008 - Standard for Automatic Transfer Switches
   2. CSA C22.2 No.178 – 1978
   3. NFPA 70 - National Electrical Code
   4. NFPA 99 – Health Care Facilities
   5. NFPA 110 - Emergency and Standby Power Systems
   6. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
   7. NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches
   8. NEC Articles 700, 701, 702
   9. International Standards Organization ISO 9001: 2008
   10. IEC 60947 – 6 – 1

PART 2 - PRODUCTS

2.01 MECHANICALLY HELD TRANSFER SWITCH

A. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single-solenoid mechanism, momentarily energized. Main operators which include over current disconnect devices will not be accepted. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.

B. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

C. All main contacts shall be silver composition.

D. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.

E. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

F. The ATS shall be provided with fully-rated neutral transfer contacts.

G. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.

2.02 GROUP 'G' CONTROLLER WITH INTEGRATED USER INTERFACE PANEL

A. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.

B. The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, inherent serial communications capability, and the ability to communicate via the Ethernet through optional communications module

C. A single controller shall provide single and three phase capability for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to ± 1% of nominal voltage. Frequency sensing shall be accurate to ± 0.1Hz. Time delay settings shall be accurate to ± 0.5% of the full scale value of the time delay. The panel shall be capable of operating over a temperature range of -20 to + 70 degrees C, and storage from -55 to + 85 degrees C.

D. The controller shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards.

E. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
   1. IEEE C37.90
   2. IEC 60947 – 6 - 1, 61000-4
   a. IEC 61000 – 4 - 2 Electrostatic Discharge Immunity
   b. IEC 61000 – 4 - 3 Radiated RF Field Immunity
   c. IEC 61000 – 4 - 4 Electrical Fast Transient/Burst Immunity
   d. IEC 61000 – 4 - 5 Surge Immunity
   e. IEC 61000 – 4 – 6 Conducted RF Immunity
   3. CISPR 11 – Conducted RF Emissions and Radiated RF Emissions

2.03 ENCLOSURE

A. The ATS shall be furnished in a NEMA type 1 enclosure unless otherwise shown on the plans.

B. Controller shall be mounted on, visable, and operational through enclosure door.

PART 3 - OPERATIONS

3.01 CONTROLLER DISPLAY AND KEYPAD

A. A graphical LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through communications port. The following parameters shall only be adjustable via DIP switches on the controller.
   1. Nominal line voltage and frequency
   2. Single or three phase sensing on normal, and single phase sensing on emergency
   3. Transfer operating mode configuration, (open transition, or delayed transition) All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals

3.02 VOLTAGE AND FREQUENCY SENSING

A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup,dropout, and trip settings capabilities (values shown as % of nominal unless otherwise specified.

Parameter	Sources	Dropout/Trip	Pickup/Reset
Undervoltage	N & E	70 to 98%	85 to 100%
Overvoltage	N & E	102 to115%	2% below trip
Undervoltage	N & E	85 to 98%	90 to 100%
Overfrequency	N & E	102 to 110%	2% bellow trip

B. Repetitive accuracy of all settings shall be within 1% at +25C

C. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.

D. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases, and frequency.

E. The backlit graphical display shall have multiple language capability. Languages can be selected from the user interface.

3.03 TIME DELAYS

A. A time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals, adjustable 0 to 6 seconds. It shall be possible to bypass the time delay from the controller user interface.

B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes 59 seconds for controlled timing of transfer of loads to emergency. It shall be possible to bypass the time delay from the controller user interface.

C. A generator stabilization time delay shall be provided after transfer to emergency adjustable 0 or 4 seconds.

D. A time delay shall be provided on retransfer to normal, adjustable 0 to 9 hours 59 minutes 59 seconds. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.

E. A cooldown time delay shall be provided on shutdown of engine generator, Adjustable 0 to 60 minutes 59 seconds.

F. All adjustable time delays shall be field adjustable without the use of special tools.

G. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minutes 59 seconds time delay in any of the following modes:
   1. Prior to transfer only.
   2. Prior to and after transfer.
   3. Normal to emergency only.
   4. Emergency to normal only.
   5. Normal to emergency and emergency to normal.
   6. All transfer conditions or only when both sources are available.

H. In the event that the alternate source is not accepted within the configured Failure to Accept time delay, the common alert indication shall become active.

I. The controller shall also include the following built-in time delay for delayed transition operation.
   1. A time delay for the load disconnect position for delayed transition operation adjustable 0 to 5 minutes 59 seconds.

3.04 ADDITIONAL FEATURES

A. The user interface shall be provided with test/reset modes. The test mode will simulate a normal source failure. The reset mode shall bypass the time delays on either transfer to emergency or retransfer to normal.

B. A set of contacts rated 2 amps, 30 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down. setting, regardless of whether the normal source restores before the load is transferred.

C. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of two contacts, closed when the ATS is connected to the normal source and two contacts closed when the ATS is connected to the emergency source.

D. A single alarm indication shall light up the alert indicator and de – energize the configured common alarm output relay for external monitoring.

E. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).

F. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency (red) source, as determined by the voltage sensing trip and reset settings for each source.

G. LED indicating light shall be provided to indicate switch not in automatic mode (manual); and blinking (amber) to indicate transfer inhibit.

H. LED indicating light shall be provided to indicate any alarm condition or active time delay (red).

I. The following features shall be built – in to the controller, but capable of being activated through keypad programming or the serial port only when required by the user:
   1. Provide the ability to select “commit/no commit to transfer” to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
   2. A variable window inphase monitor shall be provided in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the ATS manufacturer. The inphase monitor shall be equal to ASCO feature 27.
   3. An engine generator exercising timer shall be provided to configure scheduled automatic testing of an engine generator set with or without load for 20 minutes fixed. It shall be capable of being configured to indicate a day of the week, and time weekly testing should occur.

J. The following feature shall be built – into the controller, but capable of being activated through keypad programming,communications interface port, or additional hardware.
   1. Terminals shall be provided for a remote contact to signal the ATS to transfer to emergency. This inhibit signal can be enabled through the keypad or serial port.
   2. System Status - The controller LCD display shall include a “System Status” screen which shall be readily accessible from any point in the menu by depressing the “ESC” key. This screen shall display a clear description of the active operating sequences and switch position. For example:
   a. Normal Failed
   b. Load on Normal
   c. TD Normal to Emerg
   d. 2min15s

K. Controllers that require multiple screens to determine system status or display “coded” system status messages, which must be explained by references in the operator’s manual are not permissible.

L. Self Diagnostics – The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.

M. Communications Interface – The controller shall be capable of interfacing, through an optional serial communication port with a network of transfer switches, locally (up to 4000 ft.). Standard software specific for transfer switch applications shall be available by the transfer switch manufacturer. This software shall allow for the monitoring, control, and setup of parameters.

N. Data Logging – The controller shall have the ability to log data and to maintain the last 300 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non – volatile memory.

1. Event Logging:

a. Data and time and reason for transfer normal to emergency
b. Data and time and reason for transfer emergency to normal
c. Data and time and reason for engine start
d. Data and time engine stopped
e. Data and time emergency source available
f. Data and time emergency source not available

2. Statistical Data:

a. Total number of transfers
b. Total number of transfers due to source failure
c. Total number of day's controller is energized
d. Total number of hours both normal and emergency sources are available
e. Total time load is connected to normal
f. Total time load is connected to emergency
g. Last engine start
h. Last engine start up time
i. Input and output status

3.05 OPTIONAL FEATURES

A. Accessory Package - An accessory bundle shall be provided that includes:

1. A fully programmable engine exerciser with seven independent routines to exercise the engine generator, with or without load on a daily weekly, bi – weekly, or monthly basis.
2. Event log display that shows event number, time and date of events, event type, and reason (if applicable). A minimum of 300 events shall be stored.
3. RS – 485 communications port enabled.
4. Common alarm output contact.

PART 4 - ADDITIONAL REQUIREMENTS

4.01 WITHSTAND AND CLOSING RATINGS

A. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. WCR ATS ratings shall be as follows when used with specific circuit breakers:

ATS Size	Withstand & Closing Rating MCCB (480v/60hz)	W/CLF
30	10,000A	100,000
70 - 200	22,000A	200,000
230	22,000A	100,000
260 – 400	42,000A	200,000
600	50,000A	200,000

800 – 1200	65,000A	200,000
1600 – 2000	85,000A	200,000
2600 – 3000	100,000A	200,000

4.02 TESTS AND CERTIFICATION

A. The complete ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.

B. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

C. The ATS manufacturer shall be certified to ISO 9001: 2008 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001: 2008.

4.03 SERVICE REPRESENTATION

A. The ATS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

B. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

C. For ease of maintenance, the transfer switch nameplate shall include drawing numbers and serviceable part numbers.

END OF SECTION

SECTION 26 41 13

LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes lightning protection for buildings. No. 1 only.

1.03 DEFINITIONS

A. LPI: Lightning Protection Institute.

B. NRTL: National recognized testing laboratory.

1.04 SUBMITTALS

A. Product Data: For air terminals and mounting accessories.

B. Shop Drawings: Detail lightning protection system, including air-terminal locations, conductor routing and connections, and bonding and grounding provisions. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies. Indicate compatibility with roofing material and roofing system.

C. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include data on listing or certification by an NRTL or LPI.

D. Certification, signed by Contractor, that roof adhesive for air terminals is approved by manufacturers of both the terminal assembly and the single-ply membrane roofing material.

E. Field inspection reports indicating compliance with specified requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an NRTL or who is certified by LPI as a Master Installer/Designer.

B. Listing and Labeling: As defined in NFPA 780, "Definitions" Article.

1.06 COORDINATION

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

B. Coordinate installation of air terminals attached to roof systems with roofing manufacturer and Installer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Automatic Lightning Protection.
2. ERICO International Corporation.
3. Harger Lightning Protection, Inc.
4. Heary Bros. Lightning Protection Co. Inc.
5. Independent Protection Co.
6. Robbins Lightning Inc.
7. Thompson Lightning Protection, Inc.

2.02 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96.

B. Roof-Mounting Air Terminals: NFPA Class I, aluminum or copper, solid or tubular, unless otherwise indicated.
   1. Single-Membrane, Roof-Mounting Air Terminals: Designed for single-membrane roof materials.

C. Stack-Mounting Air Terminals: Stainless steel or Solid copper.

D. Ground Rods, Ground Loop Conductors, and Concrete-Encased Electrodes: Comply with Division 26 Section "Grounding and Bonding for Electrical Systems" and with standards referenced in this Section.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install lightning protection components and systems according to UL 96A and NFPA 780.

B. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends and narrow loops.

C. Contractor shall provide conduit thru the building to provide pathways as required for lighting protection system. Conceal the following conductors:
   1. System conductors.
   2. Down conductors.
   3. Interior conductors.
   4. Conductors within normal view from exterior locations at grade within 200 feet of building.
   5. Notify Architect at least 48 hours in advance of inspection before concealing lightning protection components.

D. Cable Connections: Use approved exothermic-welded connections for all conductor splices and connections between conductors and other components, except those above single-ply membrane roofing.

E. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's written instructions.

F. Bond lightning protection components with intermediate-level interconnection loop conductors to grounded metal bodies of building at 60-foot intervals.

3.02 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.03 FIELD QUALITY CONTROL

A. UL Inspection: Provide inspections as required to obtain a UL Master Label for system.

END OF SECTION

SECTION 26 43 13

SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

B. Related Requirements:
   1. Section 262413 "Switchboards" for factory-installed SPDs.
   2. Section 262416 "Panelboards" for factory-installed SPDs.

1.03 DEFINITIONS

A. Inominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to **include in maintenance manuals.**

1.06 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
   1. Manufacturers requesting product approval must meet or exceed the written specification contained herein.
   2. The registered service mark (brand) must be owned by the Manufacturer. No private label accepted.
   3. Manufacturer shall be ISO 9001 certified: Quality Systems – Model for Quality Assurance in Design, development, Production, Installation, and Servings.
   4. The Manufacturer must be regularly engaged in the manufacture of surge protection device products of the specified categories for no less than 10 (10) years.

2.02 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449 4th Edition.

D. MCOV of the SPD shall be at least 125% the nominal system voltage.

2.03 SERVICE ENTRANCE AND TRANSFER SWITCH SUPPRESSOR

A. SPDs: Listed, and complying with UL 1449 4th Edition, Type 2
   1. SPDs with the following features and accessories:
      a. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
      b. Indicator light display for protection status.
      c. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
      d. Surge counter.

B. Comply with UL 1283.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 250kA for equipment rated less than 1600A, 250kA for equipment 1600A and larger. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V and 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
   1. Line to Neutral: 800 V for 208Y/120 V.
   2. Line to Ground: 700 V for 208Y/120 V.
   3. Line to Line: 2500 V for 480Y/277 V and 1200V for 208Y/120 V.

E. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:
   1. Line to Neutral: 700 V.
   2. Line to Ground: 900V.
   3. Line to Line: 1200V.

F. SCCR: Equal or exceed 200 kA.

G. Nominal Discharge Current Rating: 20 kA.

2.04 PANEL SUPPRESSORS

A. SPDs: Comply with UL 1449 4th Edition, Type 2.
   1. Include LED indicator lights for power and protection status.
   2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
   3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.

B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 120 kA . The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

C. Comply with UL 1283.

D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V and 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
   1. Line to Neutral: 1500 V for 480Y/277 V and 800 V for 208Y/120 V.
   2. Line to Ground: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
   3. Line to Line: 2500 V for 480Y/277 V and 1200V for 208Y/120 V.

E. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:
   1. Line to Neutral: 700 V.
   2. Line to Ground: 900V.
   3. Line to Line: 1200V.

F. SCCR: Equal or exceed 100 kA.

G. Nominal Discharge Current Rating: 20 kA.

2.05 ENCLOSURES

A. Shall be side-mounted, NEMA 250, Type 1, or internal to the protected equipment enclosure in the following conditions as noted on drawings:
   1. At panelboards or transfer switches which are surface mounted indoors in a dry location.
   2. At switchgear which is floor mounted.

B. Shall be mounted internal to the protected equipment enclosure in the following conditions:
   1. At panelboards which are flush mounted.
   2. At panelboards, transfer switches, or switchgear which are specified with enclosures other than NEMA 250, Type 1.
   3. Where noted on the drawings to be integral to the equipment.

C. Shall be side mounted, NEMA 250, Type 3R or 4X in the following conditions:
   1. At equipment which is located outdoors or in a damp or wet location and is not standardly available in the industry with internal SPDs.

2.06 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD. All SPDs shall be connected through a disconnecting means. Direct connection to the bus is not acceptable.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:
   1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.02 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
   1. Compare equipment nameplate data for compliance with Drawings and Specifications.
   2. Inspect anchorage, alignment, grounding, and clearances.
   3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.03 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.04 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION

SECTION 26 51 19

LED INTERIOR LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Interior solid-state luminaires that use LED technology.
   2. Lighting fixture supports.

B. Related Requirements:
   1. Section "Wiring Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
   2. Section "Wiring Devices" for line voltage controls and wall-box dimmers.

1.03 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete, manufactured lighting unit, including lamp, reflector, and housing.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Arrange in order of luminaire designation.
   2. Include data on features, accessories, and finishes.
   3. Include physical description and dimensions of luminaires.
   4. Include emergency lighting units, including batteries and chargers.
   5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
   6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.
      a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom luminaires.
   1. Include plans, elevations, sections, and mounting and attachment details.
   2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.

C. Qualification Data: For testing laboratory providing photometric data for luminaires.

D. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
   2. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.
   3. Any other components or accessories which are excluded from warranty coverage: One for every 20 of each type, finish and rating installed. Furnish at least one of each type.

1.06 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.08 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 LUMINAIRE REQUIREMENTS

A. Refer to architectural reflected ceiling plan for exact ceiling conditions planned. Fixture shall be designed for the ceiling intended, including ceiling material, presence of insulation or sound batting, and fire rating.
   1. Where ceilings are fire rated, recessed luminaires shall be fire rated, or shall be provided with a UL Listed fire rated cover, or a field-constructed “hat” or “box,” which shall maintain the fire rating requirement and be acceptable to the AHJ.
   2. Where ceilings are indicated to have thermal insulation or sound batting installed on top of the ceiling, within 6 inches of the luminaire location, recessed luminaire shall be rated for Insulation-Contact (IC-Rated).
   3. Where ceilings are indicated to be of gyp construction, provide manufacturer’s modular flange kit for lay-in troffer type luminaires. Flange kits shall be separate from the luminaire for field installation. Integral flange adapters are not acceptable.

B. Comply with UL 8750.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

E. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

F. Recessed Fixtures: Comply with NEMA LE 4.

G. CRI of minimum 80. CCT as selected by the architect from 2700 K, 3000 K, 3500 K, or 4000 K.

H. Rated luminaire life of 50,000 hours, or as specified on the drawings.

I. Minimum efficacy of 80 lumens per watt, or as specified on the drawings.

J. Lamps dimmable from 100 percent to 10 percent of maximum light output, unless specified otherwise.
   1. Where used on the drawings, “1 percent” or “0.1 percent” dimming shall indicate dimming ranges from 100 percent to 1 percent, or 100 percent to 0.1 percent. Provide dim-to-black where specified.

K. Internal driver.

L. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

M. Housings: Powder-coat or painted finish, applied after fabrication.

2.02 DRIVER REQUIREMENTS

A. Comply with UL 8750.

B. Comply with NEMA 410.

C. Built-in surge protection (in accordance with IEEE /ANSIC82.77-5 Transient Surge Requirements). Additional surge protection as specified.

D. Dimming: Standard dimming shall utilize 0-10 volt, direct-current interface. Drivers shall be source-type, approximately 150 microamps.
   1. 0-10 volt dimming shall be provided unless specified to be without dimming or to utilize a different dimming protocol.

2.03 EMERGENCY POWER UNIT

A. Internal Type: Self-contained, modular, battery unit, factory mounted within luminaire body and compatible with supplied driver and diode(s). Comply with UL 924.
   1. Emergency Connection: Operate at least two diodes or diode strings in parallel at an output of 1000 lumens each. Connect unswitched circuit conductor to battery unit and switched circuit conductor to fixture driver.
   2. Night-Light Connection: Wire to operate luminaire continuously and connect emergency battery unit.
   3. Test Push Button and Indicator Light: Visible and accessible without entering ceiling space. Where test push button is located concealed behind a lens or diffuser, such lens or diffuser shall require no tools to remove and gain access to the test push button. Where indicator light is located concealed behind a lens or diffuser, it shall be located such that the glow is visible through the installed lens or diffuser.
      a. Test Push Button: Push-to-test type, simulates loss of normal power and demonstrates operability.
      b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
      c. Where specified, or where a luminaire meeting other specification requirements is not available with an integrated test push button and indicator light, such button and light may be remote mounted. Furnish and install a manufactured one-gang wall/ceiling plate in a one-gang junction box, flush mounted within 36 inches of fixture location. Such a device shall be located as directed by the architect.
   4. Battery: Sealed, high-temperature, maintenance-free, nickel-cadmium type.
   5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay. 24 hour maximum recharge time from full discharge.
   6. Ambient Temperature rating of 32F to 131F. Where located outdoors or otherwise specified “low temp” rating shall be suitable for 0F locations without use of a heater.
   7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of emergency unit operation at code-specified intervals. Test failure is annunciated by an integral audible alarm and flashing red LED indicator light.

B. External Type: Self-contained, modular, battery unit, remote mounted and field-wired to the fixture. Shall be compatible with supplied driver and diode(s). Comply with UL 924.

1. Emergency Connection: Operate at least two diodes or diode strings in parallel at an output of 1000 lumens each. Connect unswitched circuit conductor to battery unit and switched circuit conductor to fixture driver.
2. Night-Light Connection: Wire to operate luminaire continuously and connect emergency battery unit.
3. Test Push Button and Indicator Light: Visible and accessible on the unit housing.
   a. Test Push Button: Push-to-test type, simulates loss of normal power and demonstrates operability.
   b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
4. Housing: NEMA 250, Type 1 enclosure.
5. Battery: Sealed, high-temperature, maintenance-free, nickel-cadmium type.
6. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay. 24 hour maximum recharge time from full discharge.
7. Ambient Temperature rating of 32F to 131F. Where located outdoors or otherwise specified “low temp” rating shall be suitable for 0F locations without use of a heater.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of emergency unit operation at code-specified intervals. Test failure is annunciated by an integral audible alarm and flashing red LED indicator light.

2.04 MATERIALS

A. Metal Parts:
   1. Free of burrs and sharp corners and edges.
   2. Sheet metal components shall be steel unless otherwise indicated.
   3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during servicing and when secured in operating position.

C. Exposed Metal Hardware: Where fixture is exposed to damp or wet environments. Grade 316 Stainless Steel.

D. Diffusers and Globes:
   1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   2. Glass: Annealed crystal glass unless otherwise indicated.
   3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

2.05 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gauge.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

2.06 EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
   a. Battery: Sealed, maintenance-free, nickel-cadmium type.
   b. Charger: Fully automatic, solid-state type with sealed transfer relay.
   c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
   d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
   e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
   f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
   g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Refer to architectural reflected ceiling plan for exact location of lighting fixtures. Coordinate installation with ceiling rating. Provide fire rated cover for fixture where required. This may be a manufactured U.L. Listed cover, “hat” or box; or a site fabricated cover. The cover shall meet or exceed the fire rating requirement and meet requirements of Local AHJ. The cover shall be compatible with the IC or Non IC rating of the fixture.

D. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.
   1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners.
   2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
   3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
   4. Provide support for luminaire without causing deflection of ceiling or wall.

E. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

F. Adjust aimable lighting fixtures to provide required light intensities.

G. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

H. Provide additional conductors as required for dimming and control systems.

3.02 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.03 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation including controls.

2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal. Test using both the test push button, and separately using the associated branch circuit breaker.

3.04 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 26 09 43.16 "Addressable-Fixture Lighting Controls."

B. Comply with requirements for startup specified in Section 26 09 43.23 "Relay-Based Lighting Controls."

3.05 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Exterior luminaires with lamps and ballasts.
   2. Luminaire-mounted photoelectric relays.
   3. Poles and accessories.

B. Related Sections include the following:
   1. Division 26 Section "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

1.03 DEFINITIONS

A. CRI: Color-rendering index.

B. Luminaire: Complete lighting fixture, including driver.

C. Pole: Luminaire support structure, including tower used for large area illumination.

D. Standard: Same definition as "Pole" above.

1.04 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4.

B. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4.

C. Wind Load: Pressure of wind on pole and luminaire, calculated and applied as stated in AASHTO LTS-4.
   1. Wind speed for calculating wind load for poles exceeding 50 feet in height is 110 mph.
   2. Wind speed for calculating wind load for poles 50 feet or less in height is 110 mph.

D. Seismic: Shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. “Withstand” means that “the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified.”

1.05 SUBMITTALS

A. Product Data: For each luminaire, pole, and support component:
   1. Arranged in order of lighting unit designation.
   2. Include data on features, accessories, finishes.
   3. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
   4. Details of attaching luminaires and accessories.
   5. Details of installation and construction.
   6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.
      a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
   7. Photoelectric relays.
   8. Include life, output (lumens, CCT, and CRI), and energy efficiency data.

9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
10. Anchor bolts for poles.

B. Shop Drawings:
1. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
2. Wiring Diagrams: Power and control wiring.

C. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4 and that load imposed by luminaire has been included in design.

D. Qualification Data: For agencies providing photometric data for lighting fixtures.

E. Field quality-control test reports.

F. Warranty: Special warranty specified in this Section.

1.06 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C2, "National Electrical Safety Code."

D. Comply with NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation and positive drainage.

C. Remove factory-applied pole wrappings on metal poles immediately upon delivery to the site. Handle poles with web fabric straps.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Glass and Plastic Lenses, Covers, and Other Optical Parts: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Drivers: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: 10 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In the Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.02 LUMINAIRES, GENERAL REQUIREMENTS

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Grade 316 Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

2.03 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.
   1. Relay with locking-type receptacle shall comply with NEMA C136.10.
   2. Adjustable window slide for adjusting on-off set points.
   3. Relay shall be suitable for LED sources, including consideration for inrush.

2.04 DRIVER REQUIREMENTS

A. Comply with UL 8750.

B. Comply with NEMA 410.

C. Built-in surge protection (in accordance with IEEE /ANSIC82.77-5 Transient Surge Requirements). Additional surge protection as specified.

2.05 POLES AND SUPPORT COMPONENTS, GENERAL REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-4.
   1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in Part 1 "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.
   2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
   1. Materials: Shall not cause galvanic action at contact points.
   2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless-steel items are indicated.
   3. Anchor-Bolt Template: Plywood or steel.

D. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."

E. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4.

F. Base Covers: Manufacturer’s standard metal units, arranged to cover pole’s mounting bolts and nuts. Finish same as pole.

2.06 STEEL POLES

A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; 1-piece construction up to 40 feet in height with access handhole in pole wall.
   1. Shape: Per Fixture Schedule
   2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

B. Steel Mast Arms: Per fixture Schedule, continuously welded to pole attachment plate. Material and finish same as pole.

C. Brackets for Luminaires: Detachable, cantilever, without underbrace.
   1. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.
   2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
   3. Match pole material and finish.

D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

E. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

F. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.

G. Platform for Lamp and Ballast Servicing: Factory fabricated of steel with finish matching that of pole.

H. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

I. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
   a. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.
   1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources.

3.02 POLE INSTALLATION

A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features, unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches.
   2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
   3. Trees: 15 feet.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division 03 Section "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
   1. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
   2. Install base covers, unless otherwise indicated.
   3. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
   1. Dig holes large enough to permit use of tampers in the full depth of hole.
   2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.

F. Raise and set poles using web fabric slings (not chain or cable).

3.03 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Division 26 Section "Raceway and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.04 GROUNDING

A. Ground metal poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
   1. Install grounding electrode for each pole, unless otherwise indicated.
   2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
   1. Install grounding electrode for each pole.
   2. Install grounding conductor and conductor protector.
   3. Ground metallic components of pole accessories and foundations.

3.05 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
   1. Verify operation of photoelectric controls.

C. Illumination Tests:
   1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
      a. IESNA LM-5, "Photometric Measurements of Area and Sports Lighting."
      b. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
      c. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
      d. IESNA LM-64, "Photometric Measurements of Parking Areas."
      e. IESNA LM-72, "Directional Positioning of Photometric Data."

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaire lowering devices. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 27 05 00

COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Communications equipment coordination and installation.
   2. Sleeves for pathways and cables.
   3. Sleeve seals.
   4. Grout.
   5. Common communications installation requirements.

1.03 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.04 SUBMITTALS

A. Product Data: For sleeve seals.

1.05 COORDINATION

A. Coordinate arrangement, mounting, and support of communications equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."."

PART 2 - PRODUCTS

2.01 SLEEVES FOR PATHWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Sleeves for Rectangular Openings: Galvanized sheet steel.
   1. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
      b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.02 SLEEVE SEALS

2.03 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.02 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
   1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Protection of Roof:
   1. Coordinate electrical work with roofing work in regard to any electrical items which may pierce or otherwise affect the roof.
   2. Arrange for any cutting or repairing to roofing which might already be installed when an electrical installation is made.
   3. Roof penetrations shall not void roofing warranty. Penetrations shall be coordinated with roofing supplier holding the warranty. Electrical contractor shall coordinate with roofing supplier for installation of pre-molded pipe seal or field fabricated pipe penetration as

applicable. Electrical contractor to include all costs and coordination with and for roofing penetrations, new or existing.

4. Routing of electrical wiring thru ductwork, and penetrations of ductwork or roof curbs is not allowed.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.03 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.04 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION

SECTION 27 05 28

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Metal conduits and fittings.
   2. Nonmetallic conduits and fittings.
   3. Hooks.
   4. Boxes, enclosures, and cabinets.

1.03 DEFINITIONS

A. GRS: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

1.04 ACTION SUBMITTALS

A. Product data for the following:
   1. Surface pathways
   2. Wireways and fittings.
   3. Tele-power poles.

PART 2 - PRODUCTS

2.01 METAL CONDUITS AND FITTINGS

A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.

B. General Requirements for Metal Conduits and Fittings:
   1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
   2. Comply with TIA-569-D.

C. GRS: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. EMT: Comply with ANSI C80.3 and UL 797. Steel.

F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B. Fittings for EMT shall be steel, set screw type.

2.02 NONMETALLIC CONDUITS AND FITTINGS

A. Description: Nonmetallic raceway of circular section with manufacturer-fabricated fittings.

B. General Requirements for Nonmetallic Conduits and Fittings:
   1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
   2. Comply with TIA-569-D.

C. RNC: Type EPC-40-PVC except where noted to be Schedule 80.Then Type EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Rigid HDPE: Comply with UL 651A.

E. Continuous HDPE: Comply with UL 651A.

F. RTRC: Comply with UL 2515A and NEMA TC 14.

G. Fittings: Comply with NEMA TC 3; match to conduit or tubing type and material.

H. Solvents and Adhesives: As recommended by conduit manufacturer.

2.03 HOOKS

A. Description: Prefabricated sheet metal cable supports for telecommunications cable.

B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with TIA-569-D.

D. Galvanized steel.

E. J shape.

2.04 BOXES, ENCLOSURES, AND CABINETS

A. Description: Enclosures for communications.

B. General Requirements for Boxes, Enclosures, and Cabinets:
   1. Comply with TIA-569-D.
   2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
   3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
   4. Device Box Dimensions: 4-11/16 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep) with at least two 1 inch knock-out openings on each of two opposite sides.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Dual Service Floor Boxes: Refer to Division 26 Section “Wiring Devices” for requirements.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, with continuous-hinge cover with flush latch unless otherwise indicated.
   1. Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

H. CTC Cabinets:
   1. See drawings for requirements of “CTC” cabinet in each apartment or townhouse.

PART 3 - EXECUTION

3.01 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRS or IMC.
   2. Concealed Conduit, Aboveground: EMT with compression type fittings.
   3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
   4. Boxes and Enclosures, Aboveground: NEMA 250. Type 3R.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Severe Physical Damage: EMT.
   2. Exposed and Subject to Severe Physical Damage: IMC. Pathway locations include the following:
      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      c. Mechanical rooms.
   3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   4. Damp or Wet Locations: GRS or IMC.
   5. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: EMT.
   6. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: EMT.
   7. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: EMT.

8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel units in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 3/4-inch (21-mm) trade size.

D. Pathway Fittings: Compatible with pathways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
   3. EMT: Use set-screw, steel fittings. Use compression fittings where Type EMT is permitted outdoors. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.02 INSTALLATION

A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:
   1. NECA 1.
   2. NECA/BICSI 568.
   3. TIA-569-D.
   4. NECA 101
   5. NECA 102.
   6. NECA 105.
   7. NECA 111.

B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

C. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

D. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Comply with requirements in Division 27 Section 270544 "Common Work Results for Communications" for sleeves and sleeve seals for communications.

F. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

G. Complete pathway installation before starting conductor installation.

H. Arrange stub-ups so curved portions of bends are not visible above finished slab.

I. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.

J. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches (300 mm) of enclosures to which attached.

L. Pathways Embedded in Slabs:
   1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot (3-m) intervals.
   2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.

3. Arrange pathways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from nonmetallic conduit and fittings to metal conduit and fittings before rising above floor.

M. Stub-ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

O. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

P. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

Q. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

R. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.

S. Cut conduit perpendicular to the length. For conduits of 2-inch (50-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

T. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

U. Surface Pathways:
1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch (50-mm) radius control at bend points.
3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

V. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:
1. 3/4-Inch (21-mm) Trade Size and Smaller: Install pathways in maximum lengths of 50 feet (15 m).
2. 1-Inch (25-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

W. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.

X. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground service pathway enters a building or structure.
   3. Where otherwise required by NFPA 70.

Y. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

Z. Expansion-Joint Fittings:
   1. Install in each run of aboveground RMC and EMT that is located where environmental temperature change may exceed 100 deg F (55 deg C), and that has straight-run length that exceeds 100 feet (30 m).
   2. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
   3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

AA. Hooks:
   1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
   2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
   3. Hook spacing shall allow no more than 6 inches (150 mm) of slack. The lowest point of the cables shall be no less than 6 inches (150 mm) adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
   4. Space hooks no more than 5 feet (1.5 m) o.c.
   5. Provide a hook at each change in direction.

BB. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

CC. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall and plumb. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

DD. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

EE. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

FF. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

GG. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated.
   2. Underground Warning Tape: Comply with requirements in Division 26 Section "Identification for Electrical Systems."

3.04 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 27 Section "Common Work Results for Communication."

3.05 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.06 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 27 10 20

COMMUNICATIONS WIRING

(BUILDING NO. 1)

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install voice and network cabling for building No. 1 as indicated on drawings and as called for hereinafter. This specification is for a network cabling system. Products specified hereinafter shall be tested to 400 megaHertz, ETL verified.

B. This standard also establishes performance criteria for various system configurations and their elements.

C. All UTP terminations are to be to the T68A wiring scheme.

D. Provide new voice, data, and cable TV wiring within each apartment. All voice/data outlets shall receive a Cat 5e cable. TV outlets shall receive one Cat 5e and one RG-6.

E. For communications outlets in building not located in apartments, provide one Cat 5e cable to TTS, install RJ45 jack at outlet, terminate on patch panel at TTS.

F. Provide for all closed-circuit TV cameras, one Cat 5e cable to CCTV switch to be provided by others.

1.02 CABLING STRUCTURE

A. The elements of a cabling system are listed below:
   1. Horizontal Cabling
   2. Backbone Cabling
   3. Work Area
   4. Telecommunications Room
   5. Equipment Room
   6. Entrance Facilities

B. HORIZONTAL CABLING
   1. Horizontal cabling shall be of star topology, each work area connector shall be connected to a telecommunications closet. The maximum horizontal distance shall be 90 meters. An additional 10 meters is allowed for work area cables, patch cables, etc.
   2. The amount of untwisting of individual pairs to terminate shall be less than or equal to .5 in. for Category 5E.
   3. Cable bend radius shall not be less than 4 times the cable diameter.

C. BACKBONE CABLING:
   1. The purpose of backbone cabling is to provide interconnections between telecommunications entrance facilities, equipment rooms and closets. The backbone cabling includes transmission media, intermediate and main cross-connects, and mechanical terminations.
   2. Backbone cabling shall use the conventional hierarchical star topology.

D. WORK AREA:
   1. Some networks require application specific electrical components on the telecommunications outlet of the horizontal cabling. These application specific components shall not be installed as part of the horizontal cabling.
   2. When needed they shall be placed external to the outlet.

E. REFERENCE STANDARDS
   1. BICSI TDMM 12th Edition (Telecommunications Distribution Methods Manual).
   2. ANSI/NECA/BICSCI-568, Standard for Installing Commercial Building Telecommunications Cable.
   3. ANSI/TIA/EIA 569-B, General Building Standards for Telecommunications Pathways and Spaces.

4. ANSI/TIA/EIA 568-B, Commercial Building Telecommunications Cabling Standard.
5. ANSI/TIA/EIA 606-A, Administration Standard for Commercial Telecommunications Infrastructure.
6. ANSI/TIA/EIA 758, Customer Owned Outside Plant Telecommunications Cabling Standard.
7. ANSI/TIA/EIA-526, 7 and 14, Telecommunications Measurements of Optical Fiber Single and Multi Mode Power Loss.
8. FCC 68, Connection of Terminal Equipment to the Telephone Network.
9. ADA of 1992 and Telecommunications Act of 1996, Physically Impaired and Accessibility.
10. BICSI ITSIMM current edition (Information Technology Systems Installation Methods Manual).
11. ANSI/TIA/EIA 568-C.0, Generic Telecommunications Cabling for Customer Premises Standard Series.

    568-C.1 Commercial Building Cabling

    568-C.2 Copper Cabling Components

    568-C.3 Fiber Cabling Components

    568-C.4 Coax Cabling Component
12. NFPA-70, NEC-2008 (National Electrical Code).
13. All applicable State, Municipal, and Campus codes, standards and statutes.

F. ADMINISTRATION STANDARD FOR COMMUNICATIONS INFRASTRUCTURE:
1. Purpose: The purpose of this standard is to provide a uniform administration scheme that is independent of the applications. This standard defines guidelines for contractors involved in the installation of the computer cabling system.
2. Scope: This standard specifies the administrative requirements of the communications infrastructure within a building or campus.
3. Areas to be administered are as follows:
   a) Terminations for the communications media
   b) Communications media between terminations
   c) Pathways between terminations
   d) Spaces where terminations are located
   e) Bonding and grounding
4. Pathway and Space Administration: All spaces must be labeled. Labels should be affixed at the entrance of the space.
5. Wiring System Administration: This section describes the administration of cables, termination hardware, splices and termination position. As changes are made, effected labels, records, drawings and reports shall be updated.
   a) Horizontal and backbone subsystem cables shall be labeled at each end. Labels shall be used instead of marking the cable. Label intermediate locations such as manholes, pull boxes and conduit ends.
   b) Each termination hardware or label shall be marked with an identifier.
   c) Each termination position label shall be recorded with an identifier.
   d) Each splice closure or label shall be marked with an identifier.
   e) “TMGB” shall be marked on the Telecommunications Main Grounding Busbar.

G. LABELING AND COLOR CODING:
1. Labels are divided into 3 categories:
   Adhesive
   Insert
   Other
   a) Adhesive labels shall meet adhesion, defacement and legibility requirements defined in U.L. 969. Labels shall also meet exposure requirements in U.L. 969.
   b) Insert labels shall also meet U.L. 969 requirements for defacement, legibility and general exposure.

c) Other labels include special purpose labels, such as tie-on labels.

2. All bar codes shall be either Code 39 or Code 128 confirming to USS-39 and USS-128 respectively. All Code 39 bar code ratios shall be within 2.5:1 to 3.0:1. If a wand scanner is to be used, a minimum quiet zone of 6.35mm is required on each side of the bar code.

H. COLOR CODING RULES:
1. Termination labels at the two ends of the cable shall be of the same color.
2. Cross-connectors made between termination fields are generally of two different colors.
3. The color orange is used for the demarcation point.
4. Green is for the network connections on the customer side of the demarcation point.
5. Purple is for the termination of cables originating from common equipment.
6. White is for the first level backbone media.
7. Gray is for the second level backbone.
8. Blue is for the termination of station telecommunicators media.
9. Brown is for interbuilding backbone cable terminations.
10. Yellow is for termination of auxiliary circuits, alarms, security, and other miscellaneous circuits.

I. DIFFERENTIATION OF TERMINATION FIELDS BY PERFORMANCE CATEGORY
1. If cables are of different performance classes, their ends should indicate the difference. The labels shall be marked with the proper category of the cable.

J. INSTALLER QUALIFICATIONS
1. Installer of cabling installation specified herein must be a certified trained installer using ANSI TIA/EIA Standards and the current edition of the BICSI TDMM (Telecommunications Distribution Methods Manual, Tenth Edition) as a guide for installation of inside cabling and associated components. Installer must have experience using Mohawk/Hubbell Cabling Systems. Provide written documentation of these qualifications as part of the submittal process.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cables:
1. CAT 6e Cable, Hitachi ECO 30237-8-BL-2 or Hubbell Nextspeed C5RRB.

B. Connectors:
1. CAT 6 Jacks, Hubbell Nextspeed, Orange, HXJ5OR.
2. Data Jack Icon, Hubbell IR100C
3. Phone Jack Icon, Hubbell IGY100T.

C. Cross-Connects:
1. CAT6 Patch Panel, 48 port, Hubbell, Nextspeed, Black, P6E48U.
2. CAT6 Patch Panel, 24 port, Hubbell, Nextspeed, Black, P6E24U.
3. 110 Blocks, Backbone, 5 pair, Hubbell, 110BLK50FTK5.
4. 110 Blocks, Horizontal, 4 pair, Hubbell, 110BLK50FTK4.
5. UTP Protectors (CAT3) Circa 1880 series, 110 block, 5 pin modules 330-180.

D. Cable Management:
1. Network Rack with “3.25” C-Channels, Black, Hubbell Nextframe CS-1973.
2. Horizontal Management, Hubbell, HC219CE3N.
3. Cable Management Rings, Hubbell, MCCPSR4.
4. Cable Management Troughs, (110 blocks), Hubbell, 110TRA.
5. Cable Tray, (for ER/TR) Hubbell Next Frame, 18”, “HL” Series, or Cooper B-Line SB17U18B.
6. Cable Tray, (for corridors), Hubbell, 18”, “HPW” Series, or Cooper B-Line SB17U18B.
7. Wire Basket, Cooper B-Line, WB212.
8. J-Hooks, (up to 40 cables), Cooper B-Line BCH32.

9. J-Hooks, (up to 10 cables), Cooper B-Line BCH12.
10. Equipment Shelf, Hubbell MCCCS19P.

E. Work Area Outlets:
1. Office/Classroom Faceplate, 4 port, Hubbell AFP14EI (Electrical Ivory).
2. Blank Faceplate inserts, Hubbell, Electrical Ivory SFBE10.
3. Blank Faceplate inserts, Hubbell, Black, SFBB10.
4. Blank Faceplate inserts, Hubbell, Gray, SFBG10.

F. Miscellaneous:
1. Firestop Hilti "Moldable Pliable Putty" CP-618. *Tube putty and caulk that cures to an elastomeric solid is not approved in conduit.*
2. Fire Retardant Paint, Benjamin Moore M59-220 (white), up to 2 oz. of tint allowed per gallon.
3. Telecommunications Grounding Busbar (TGB), Homaco WMBB-12 or Hubbell RKTGB.
4. Power Strip, (for network rack), Hubbell PR10420.

G. Wall-Station Jacks:
1. Network: Hubbell Speedgain, blue, HXJ5EB.
2. Network Icon: Hubbell IR, 100C.

H. Wall-Station Faceplates: Wall station faceplates in office areas shall be Hubbell AFP14EI Series with four port angled plate, color to match electrical outlets. All unused ports shall be provided with blank inserts, Hubbell SFBE10 Series. Provide blank inserts as required.

I. All network horizontal cabling shall be Cat 6 cable. Plenum-rated cable shall only be required in areas where "plenum return" is provided as part of HVAC system. Otherwise, non-plenum rated cable shall be permissible. All network cable shall have blue outer insulation.

Plenum Rated: Mohawk M56168.

Non-Plenum Rated: Mohawk M56167.

Leave 8" of slack for each termination at wall outlet location. Leave one meter (3.28') slack above each wall outlet location. Cable slack shall not be stored in bundled loops. Cable slack shall be stored in an extended loop or in a Figure 8 configuration.

PART 3 EXECUTION

3.01 INTERIOR BUILDING INSTALLATION:

A. Wiring to central apartment "CTC" cabinets shall be installed by others (AT&T or Comcast).

B. Installation of all data wiring facilities shall be by personnel regularly engaged in the installation of local area network cabling.

C. All wiring shall be color coded and terminated. All cabling shall be Cat 6 terminated to T568A wiring scheme.

D. Submit shop drawings for approval.

E. All cables shall be tested for shorts, crossed, opens, grounds, splits, and transpositions. Each cable pair will be tested and documented and the test results will be supplied to the owner for review and acceptance. Each Category 6 cable will be tested for wire map, lengths, insertion loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, return loss, propogation delay, and delay skew. Each cable shall be tested utilizing a Level 3 tester. The test equipment will be capable of testing Category 5E cables. Fiber optic test will measure the end to end attenuation bidirectional at their two corresponding wavelengths, multi-mode at 850 nm and 1300 nm, single-mode at 1310 nm and 1550 nm. All fibers shall be measured for overall length. Each cable will be documented on a hard copy and floppy disk format for review and acceptance by owner. The owner will evaluate the test results for "pass/fail". Contractor shall satisfactorily repair any failed cable test such that all cables pass as required.

F. During installation of cabling, the bend radius of cables is not to be less than the manufacturer's specific recommendation. Minimum bend radius shall be 10 times the diameter of the cable for

fiber optic cable, and 4 times the diameter of the cable for copper cable. Contractor shall take and precaution not to exceed maximum tensile rating of cabling during installation.

G. Each horizontal cabling run shall include 10' of slack at telecommunications room end and 8" of slack at the outlet end. There shall also be one meter (3.28') of slack above each wall outlet and one meter stack in distribution panel. Station cables in the telecommunications rooms can be stored in a "Figure 8" configuration to maintain the proper bend radius and provide the needed slack.

H. Labeling of cables, wall outlets, 110 blocks, conduits, cable trays, patch panels, and backbone cabling shall be performed in accordance with requirements of the Owner.

I. All testing requirements set forth in this section shall be performed by an independent third party company regularly engaged in testing of communications installations such as this.

J. As part of close-out documents, contractor shall provide "as built" drawings for communications wiring system which shall include rack layouts, backbone routes, and wall outlet locations with all labeling information included.

3.02 WARRANTY

A. Provide 10-year warranty of system as set forth hereinafter.

END OF SECTION

SECTION 27 10 21

COMMUNICATIONS WIRING

(BUILDINGS NO. 2 THRU NO. 9)

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide rough-in of cable TV and AT&T telephone service to exterior of each building.

B. Provide empty raceway from exterior of facilities to a flush-mounted communications cabinet within every residence.

C. Pre-wire each unit with TV cable and telephone wiring as called for hereafter. All wiring to be terminated in central communications panel (CWP).

PART 2 - PRODUCTS

2.01 MATERIALS

A. Each unit shall have installed a flush-mounted cabinet (CTC), for termination of individual townhouse TV and telephone wiring.

B. For each CTC, provide standard power kit which includes a tamper-resistant 120-volt duplex receptacle. Power from closest receptacle circuit

C. Cable TV wiring shall consist of a coaxial cable, Type RG6. At TV outlets terminate in “F” type jack. TV and data wiring shall consist of Cat 5E cable.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Coordinate exact termination of 3” conduit for AT&T with AT&T. Provide pullstring in conduit.

B. Arrange for cable TV with Comcast. Extend empty conduit to point directed by Comcast for cable TV.

C. From each unit communications panel (CTC), provide total of two 3/4” conduit to exterior of facilities. One will be to AT&T demark location, and one will be to Comcast demark location. Provide pull string in each conduit.

D. See drawings for specific cables to be roughed in for TV and telephone outlets.

END OF SECTION

SECTION 27 11 00

COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Telecommunications mounting elements.
   2. Backboards.
   3. Telecommunications service entrance pathways.
   4. Grounding.

B. Related Sections:
   1. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.
   2. Division 27 Section "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.
   3. Division 28 Section "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

1.03 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. LAN: Local area network.

C. RCDD: Registered Communications Distribution Designer.

1.04 PERFORMANCE REQUIREMENTS

1.05 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
   3. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
   1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of RCDD, RCDD/NTS, or Commercial Installer, Level 2.
   2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician or Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
   3. Field Inspector: Currently registered by BICSI as RCDD or Commercial Installer, Level 2 to perform the on-site inspection.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

D. Grounding: Comply with ANSI-J-STD-607-A.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and work above ceilings is complete.

1.08 COORDINATION

A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.
   1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
   2. Record agreements reached in meetings and distribute them to other participants.
   3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
   4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.

B. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

PART 2 - PRODUCTS

2.01 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
   1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
   2. Support brackets with cable tie slots for fastening cable ties to brackets.
   3. Lacing bars, spools, J-hooks, and D-rings.
   4. Straps and other devices.

C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
   1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.02 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels specified in Division 06 Section "Rough Carpentry."

2.03 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.

B. Telecommunications Main Bus Bar:
   1. Connectors: Mechanical type, cast silicon bronze, solderless compression or exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
   2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.

3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

C. Comply with ANSI-J-STD-607-A.

2.04 LABELING

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.01 ENTRANCE FACILITIES

A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.

B. Install underground pathways complying with recommendations in TIA/EIA-569-A, "Entrance Facilities" Article.

C. Install underground entrance pathway complying with Division 26 Section "Raceway and Boxes for Electrical Systems.

3.02 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.

C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.03 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."Comply with TIA/EIA-569-A, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.04 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

1. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

3.05 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements.

C. Labels shall be preprinted or computer-printed type.

END OF SECTION

SECTION 28 05 00

COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Electronic safety and security equipment coordination and installation.
   2. Sleeves for raceways and cables.
   3. Sleeve seals.
   4. Grout.
   5. Common electronic safety and security installation requirements.

1.03 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.04 SUBMITTALS

A. Product Data: For sleeve seals.

1.05 COORDINATION

A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."."

PART 2 - PRODUCTS

2.01 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Sleeves for Rectangular Openings: Galvanized sheet steel.
   1. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
      b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.02 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.03 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.02 SLEEVE INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

A. Electronic safety and security penetrations occur when raceways, pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
   1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Protection of Roof:
   1. Coordinate electrical work with roofing work in regard to any electrical items which may pierce or otherwise affect the roof.
   2. Arrange for any cutting or repairing to roofing which might already be installed when an electrical installation is made.
   3. Roof penetrations shall not void roofing warranty. Penetrations shall be coordinated with roofing supplier holding the warranty. Electrical contractor shall coordinate with roofing supplier for installation of pre-molded pipe seal or field fabricated pipe penetration as applicable. Electrical contractor to include all costs and coordination with and for roofing penetrations, new or existing.
   4. Routing of electrical wiring thru ductwork, and penetrations of ductwork or roof curbs is not allowed.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.03 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.04 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION

SECTION 28 16 43

RADIO SIGNAL BOOSTER SYSTEM

PART 1 - GENERAL

1.01 EMERGENCY RADIO COMMUNICATION ENHANCEMENT SYSTEM (BDA SYSTEM)

A. General

1. Provide an in-building radio signal amplification system to provide complete coverage in the building for the public safety agencies as required by the local fire department and other agencies and authorities having jurisdiction. System users shall receive and transmit radio broadcasts from their portable radio units within the building. This shall be accomplished utilizing the following components:
   a. Bi Directional Amplifiers (Signal Boosters)
   b. Plenum rated Coaxial Cable
   c. Antennas
   d. Cable taps
   e. Connectors
   f. Power dividers
   g. Other components and interconnecting circuitry as required
2. The system shall comply with the requirements of UL2524 1st Edition In-building 2-Way Emergency Radio Communication Enhancement Systems, NFPA 72 2010 Edition, NFPA 1221 2016 Edition and IFC 2018, as referenced.
3. The entire system shall meet with approval of the Fire Department, the Building Department and all other agencies and authorities having jurisdiction (AHJ).
4. The work in this section shall include the responsibility for all filings with the AHJ. Where filings require engineer's signature, documents shall be submitted for his review and signature. This responsibility shall include furnishing of required quantities of floor plans, descriptive notes and/or specifications, wiring diagrams, shop drawings and amendment forms.
5. Early completion of the in-building emergency radio communication enhancement system will be required as to permit a Certificate of Occupancy to be obtained in a timely manner
6. Any permits necessary for the installation of the work shall be obtained prior to the commencement of the work. All permit costs and inspection fees shall be included as the part of the required work.
7. The in-building emergency radio communication enhancement system shall use a UL2524 1st Edition, NFPA-72 2010 Edition, NFPA 1221 2016 Edition and IFC 2018 compliant NOTIFIER® signal booster or approved equal.

B. Design requirements

1. In-building emergency radio communication enhancement systems for emergency responders are an integral component of the life safety equipment of a building or structure. The primary function is to provide reliable emergency responder communications at the required signal strength within the specified areas.
2. Critical Areas such as emergency command center, fire pump room, exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations and similar critical areas shall be provided with 100% floor area radio coverage.
3. General building areas shall be provided with 95% radio coverage, or as specified by AHJ.
4. The In-building emergency radio communication enhancement systems must provide the following signal strengths:
   a. Downlink - Minimum signal strength of -95 dBm throughout the coverage area.
   b. Uplink - Minimum signal strength of -95 dBm received at the AHJ Radio System.
5. The system shall be complete with all components and wiring required for compliance with all applicable codes and regulations, and for its operations described hereinafter.
6. EC shall sub-contract an approved manufacturer or a qualified and approved vendor to supply, test and determine locations of components which are required for proper operation

as well as to supply, deploy, test and certify the performance of the complete system. Vendor qualifications must be acceptable to the AHJ.

7. All tests shall be conducted, documented, and signed by a person in possession of an FCC General Radio Telephone Operators License. All testing personnel shall be certified and authorized by the signal booster manufacturer in the installation and operation of their equipment. Personnel qualifications must be acceptable to the AHJ.
8. The system design shall be based on the NOTIFIER® line of Public Safety Signal Boosters UL2524 1st Edition, NFPA-72 2010 Edition, NFPA 1221 2016 Edition, IFC 2018 Edition and FCC compliant to establish standards of quality for materials and performance. The naming of a specific manufacturer or a catalog number does not waiver any requirement or performance of individual components described in the specifications.
9. Assembly and installation of all components of the Emergency Responder Radio Communication Enhancement System shall comply with all applicable sections of the National Electrical Code.
10. Survivability from attack by fire shall meet NFPA 72, National Fire Alarm and Signaling Code, 2010 edition and NFPA 1221 2016 edition.
11. The system must comply with all applicable sections of the FCC rules. Signal booster shall have FCC certification prior to installation.
12. Antenna isolation shall be maintained between the donor antenna and all inside antennas (D.A.S.) to a minimum of 20dB under all operating conditions

C. Technical Specifications and Performance Requirements

1. The system specified shall be based upon NOTIFIER® line of Public Safety UL2524 1st Edition, NFPA-72 2010 Edition, NFPA 1221 2016 Edition, IFC 2018 Edition compliant signal boosters
2. The signal booster shall be a Class B Public Safety type as designated by the FCC and as required by the AHJ.
3. The secondary power supplies, battery chargers and system monitoring shall be fully compliant with NFPA-72, 2010 edition and NFPA 1221, 2016 edition. The signal booster shall have both the primary and the secondary power supplies built in a fully sealed NEMA-4 type approved enclosure.
4. All signal boosters and other active system components must have FCC certification prior to installation. The equipment FCC ID must be shown on the product datasheets and technical submittals. The ID must also be displayed on the product as required by the FCC.
5. The signal booster shall be set and tuned by the equipment manufacturer to pass frequencies as specified by the local fire department.
6. To reduce the possibility of unwanted interference affecting the operation of the system, signal boosters shall be band or channel selective type with a maximum 3dB channel bandwidth of 200KHz (Fc +/- 100KHz). Wide-band signal boosters shall not be accepted, unless required to cover multiple channels within the same band.
7. Signal Boosters shall have oscillation prevention circuitry to protect the public safety radio system in case of signal booster malfunction.
8. Signal Booster gain shall be rated at minimum of 80dB and the gain shall be adjustable in a minimum of 25dB range. System gain shall be set and documented at the time of the final system test.
9. Maximum Propagation delay of the signal booster system shall be 14µs (microseconds) or as specified by AHJ.
10. The signal booster system shall include built-in automatic alarming of malfunctions of the signal booster and battery system as per NFPA 1221 2016 Edition Section 9.6, NFPA 72, 2010 Edition, Sections 24.5.2.6.1, and 24.5.2.6.2. Aftermarket equipment add-ons and modifications to comply with this specification will not be accepted.
11. A dedicated supervised monitoring panel shall be provided within the emergency command center or other location as designated by AHJ to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:
    a. Normal AC power

b. Signal booster trouble
c. Antenna Failure
d. Loss of normal AC power
e. Failure of battery charger
f. Low battery capacity

12. The signal booster system shall include a built-in NOTIFIER® addressable monitor module for NOTIFIER® Fire Alarm Panel connection for monitoring the signal booster.
13. The vendor shall verify the system monitoring requirements with the AHJ prior to system installation. System monitoring shall be fully compliant with the AHJ requirements.
14. External filters, attachments or other aftermarket modifications of the original equipment shall not be accepted.
15. All signal booster components shall be contained in a NEMA4-type approved waterproof cabinet. All enclosures shall be painted red with signage in bright yellow or as required by AHJ

D. Installation Requirements

1. Assembly and installation of all components of the Emergency Responder Communication Enhancement System shall comply with all applicable sections of the National Electrical Code, NFPA-70 and the National Fire Alarm and Signaling Code, NFPA-72, NFPA 1221 current enforceable editions.
2. At least 2 independent and reliable power supplies shall be provided as specified in sections 2 and 3 below.
3. The primary power source shall be supplied from a dedicated twenty (20) ampere branch circuit and comply with NFPA-70 National Electrical Code, NFPA 72, National Fire Alarm and Signaling Code, 2010 edition and NFPA 1221 2016 edition.
4. The emergency responder radio coverage enhancement system shall be equipped with a secondary source of power. The secondary source of power shall be a battery system with a dedicated battery charger powered by a separate, dedicated twenty (20) ampere branch circuit. The secondary power supply shall supply power automatically when the primary power source is lost. The secondary source of power shall be capable of operating the emergency responder radio coverage enhancement system for a period of at least 24 hours. The battery system shall automatically charge in the presence of external power input. Battery charger and all other electronic components must be fully enclosed in a non-vented NEMA4 Type approved enclosure. Batteries shall be enclosed in a separate, vented NEMA 3R Type approved enclosure.
5. The signal booster shall be designed to allow degraded performance in adverse conditions, such as high temperatures in the event of heat from a nearby fire, voltage fluctuations or other abnormal conditions that may occur during an emergency. Circuits that intentionally disable the signal booster in such situations (i.e. under/over voltage, over/under current, over/under temperature, etc.) are not acceptable. External UPS (Uninterruptable Power Supplies) are not acceptable. It is the purpose of this specification to assure the maximum possible level of communications to public safety personnel depending upon the signal booster, even to the extent of damaging the signal booster, as long as some communications benefit can be provided during the emergency.
6. System design shall be such that neither the failure of the normal power source, the transfer to an emergency source, nor the re-transfer to the normal source shall cause a change in system status.
7. The amplifier shall be housed in a 2-hour fire rated room or other suitable space as approved by the Engineer, or where specifically shown on the drawing.
8. Radiating cable, if used, shall be run without conduit. All other cable can be run in conduit if required for mechanical protection of the cable, or where specified by the electrical engineer.
9. RF Coaxial Cable shall be a fire-resistant, low-smoke type, U.L. classified as plenum. The classification shall be clearly marked on the outer surface of the cable regular intervals.

E. Acceptance and Test Procedures
   1. Acceptance testing for an in-building radio system is required upon completion of installation.
   2. The coverage testing shall be done in accordance with NFPA 72, National Fire Alarm and Signaling Code, 2010 edition, NFPA 1221 2016 edition and as required by the local AHJ
   3. All tests shall be conducted, documented, and signed by a person in possession of a current FCC General Radio Operator License.
   4. All test records along with system diagrams, equipment specifications, user manuals, RF link budget calculations, battery backup calculation and other design data shall be submitted upon completion of the project.

END OF SECTION

SECTION 28 31 11

DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

(BUILDING NO. 1)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Fire-alarm control unit.
   2. Manual fire-alarm boxes.
   3. System smoke detectors.
   4. Heat detectors.
   5. Notification appliances.
   6. Magnetic door holders.
   7. Remote annunciator.
   8. Addressable interface device.
   9. Digital alarm communicator transmitter.
   10. Radio alarm transmitter.
   11. System printer.

1.03 DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

1.04 SYSTEM DESCRIPTION

A. Noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

1.05 PERFORMANCE REQUIREMENTS

1.06 SUBMITTALS

A. General Submittal Requirements:
   1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
   2. Shop Drawings shall be prepared by persons with the following qualifications:
      a. Trained and certified by manufacturer in fire-alarm system design.
      b. NICET-certified fire-alarm technician, Level IV minimum.
      c. Licensed or certified by authorities having jurisdiction.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.
   1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
   2. Include voltage drop calculations for notification appliance circuits.
   3. Include battery-size calculations.
   4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
   5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector

housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.

6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
   2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

E. Qualification Data: For qualified Installer.

F. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

G. Field quality-control reports.

H. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
   2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
   3. Record copy of site-specific software.
   4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
      a. Frequency of testing of installed components.
      b. Frequency of inspection of installed components.
      c. Requirements and recommendations related to results of maintenance.
      d. Manufacturer's user training manuals.
   5. Manufacturer's required maintenance related to system warranty requirements.
   6. Abbreviated operating instructions for mounting at fire-alarm control unit.
   7. Copy of NFPA 25.

I. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On magnetic media or compact disk, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.

C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL, or

F. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.08 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
   1. Notify Architect or Owner no fewer than two days in advance of proposed interruption of fire-alarm service.
   2. Do not proceed with interruption of fire-alarm service without Architect's or Owner's written permission.

1.09 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.10 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
   1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
   2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
   3. Smoke Detectors, Fire Detectors, and Flame Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
   4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than 1 unit of each type.
   5. Keys and Tools: One extra set for access to locked and tamperproofed components.
   6. Audible and Visual Notification Appliances: One of each type installed.
   7. Fuses: Two of each type installed in the system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Faraday; Siemens Building Technologies, Inc.
2. Fire Control Instruments, Inc.; a Honeywell company.
3. Fire Lite Alarms; a Honeywell company.
4. Gamewell; a Honeywell company.
5. GE Infrastructure; a unit of General Electric Company.
6. Gentex Corporation.
7. NOTIFIER; a Honeywell company.
8. Siemens Building Technologies, Inc.; Fire Safety Division.
9. Fahrenheit ; a Honeywell company.
10. SimplexGrinnell LP; a Tyco International company.

2.02 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
   1. Manual stations.
   2. Heat detectors.
   3. Flame detectors.
   4. Smoke detectors.
   5. Duct smoke detectors.
   6. Verified automatic alarm operation of smoke detectors.
   7. Automatic sprinkler system water flow.
   8. Heat detectors in elevator shaft and pit.
   9. Fire-extinguishing system operation.
   10. Fire standpipe system.

B. Fire-alarm signal shall initiate the following actions:
   1. Continuously operate alarm notification appliances.
   2. Identify alarm at fire-alarm control unit and remote annunciators.
   3. Transmit an alarm signal to the remote alarm receiving station.
   4. Unlock electric door locks in designated egress paths.
   5. Release fire and smoke doors held open by magnetic door holders.
   6. Activate voice/alarm communication system.
   7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
   8. Close smoke dampers in air ducts of designated air-conditioning duct systems.
   9. Recall elevators to primary or alternate recall floors.
   10. Activate emergency shutoffs for gas and fuel supplies.
   11. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:
   1. Valve supervisory switch.
   2. Low-air-pressure switch of a dry-pipe sprinkler system.
   3. Elevator shunt-trip supervision.

D. System trouble signal initiation shall be by one or more of the following devices and actions:
   1. Open circuits, shorts, and grounds in designated circuits.
   2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
   3. Loss of primary power at fire-alarm control unit.
   4. Ground or a single break in fire-alarm control unit internal circuits.
   5. Abnormal ac voltage at fire-alarm control unit.
   6. Break in standby battery circuitry.
   7. Failure of battery charging.
   8. Abnormal position of any switch at fire-alarm control unit or annunciator.
   9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
   10. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

2.03 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:
   1. The basis for design shall be the Silent Knight No. 6820 Fire Alarm Control Panel. This panel shall operate all building devices as well as monitor all remote Silent Knight No. 6700 FRE alarm control panels in townhouse buildings No. 2 thru No 9. System shall be tied together via fiber optic cable. The 6820 panel shall monitor the current panels plus allow for additional buildings in the future.
   2. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
      a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
      b. Include a real-time clock for time annotation of events on the event recorder and printer.
   3. Addressable initiation devices that communicate device identity and status.
      a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
      b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
   4. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
   1. Annunciator and Display: Liquid-crystal type, 2 line(s) of 40 characters, minimum.
   2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:
   1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.
      a. Initiating Device Circuits: Style B.
      b. Notification Appliance Circuits: Style X.
      c. Signaling Line Circuits: Style 3.
      d. Install no more than 50 addressable devices on each signaling line circuit.
   2. Serial Interfaces: Two RS-232 ports for printers.

D. Smoke-Alarm Verification:
   1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
   2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
   3. Record events by the system printer.
   4. Sound general alarm if the alarm is verified.
   5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

E. Notification Appliance Circuit: Operation shall sound in a temporal pattern.

F. Elevator Recall:
   1. Smoke detectors at the following locations shall initiate automatic elevator recall.
      a. Elevator lobby detectors except the lobby detector on the designated floor.
      b. Smoke detector in elevator machine room.
      c. Smoke detectors in elevator hoistway.
   2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
   3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

G. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

I. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

J. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided as a special module that is part of fire-alarm control unit.
   1. Indicated number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711 and be listed by an NRTL.
      a. Allow the application of and evacuation signal to indicated number of zones and, at same time, allow voice paging to the other zones selectively or in any combination.
      b. Programmable tone and message sequence selection.
      c. Standard digitally recorded messages for "Evacuation" and "All Clear."
      d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification appliance circuits of fire-alarm control unit.
   2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
   3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

K. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals supervisory and digital alarm communicator transmitters and digital alarm radio transmitters shall be powered by 24-V dc source.
   1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

L. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
   1. Batteries: Sealed lead calcium.

M. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.04 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
   1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
   2. Station Reset: Key- or wrench-operated switch.

3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
4. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.05 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:
   1. Comply with UL 268; operating at 24-V dc, nominal.
   2. Detectors shall be two-wire type.
   3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
   4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
   5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
   6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
   7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
      a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
      b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
      c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:
   1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
   2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
      a. Primary status.
      b. Device type.
      c. Present average value.
      d. Present sensitivity selected.
      e. Sensor range (normal, dirty, etc.).

C. Ionization Smoke Detector:
   1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
   2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
      a. Primary status.
      b. Device type.
      c. Present average value.
      d. Present sensitivity selected.
      e. Sensor range (normal, dirty, etc.).

D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.
   1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
   2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
      a. Primary status.
      b. Device type.

c. Present average value.
d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.06 SYSTEM SMOKE DETECTORS

A. Single-Station Smoke Detectors:
1. See drawings for requirements of the single station smoke detectors for the townhouses or apartments.

B. Single-Station Duct Smoke Detectors:
1. Comply with UL 268A; operating at 120-V ac.
2. Sensor: LED or infrared light source with matching silicon-cell receiver.
   a. Detector Sensitivity: Smoke obscuration between 2.5 and 3.5 percent/foot when tested according to UL 268A.
3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. The fixed base shall be designed for mounting directly to air duct. Provide terminals in the fixed base for connection to building wiring.
   a. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.07 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.
1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.08 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

B. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

C. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.

D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level

of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

E. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
   1. Rated Light Output:
   a. 15/30/75/110 cd, selectable in the field.
   2. Mounting: Wall mounted unless otherwise indicated.
   3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
   4. Flashing shall be in a temporal pattern, synchronized with other units.
   5. Strobe Leads: Factory connected to screw terminals.
   6. Mounting Faceplate: Factory finished, red.

F. Voice/Tone Notification Appliances:
   1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
   2. High-Range Units: Rated 2 to 15 W.
   3. Low-Range Units: Rated 1 to 2 W.
   4. Mounting: semirecessed or surface mounted and bidirectional.
   5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

2.09 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
   1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
   2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
   3. Rating: 24-V ac or dc.
   4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.10 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
   1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.11 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall and to circuit-breaker shunt trip for power shutdown**.**

2.12 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report

telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:
   1. Verification that both telephone lines are available.
   2. Programming device.
   3. LED display.
   4. Manual test report function and manual transmission clear indication.
   5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:
   1. Address of the alarm-initiating device.
   2. Address of the supervisory signal.
   3. Address of the trouble-initiating device.
   4. Loss of ac supply or loss of power.
   5. Low battery.
   6. Abnormal test signal.
   7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.13 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
   1. Factory fabricated and furnished by manufacturer of device.
   2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
   1. Connect new equipment to existing control panel in existing part of the building.
   2. Connect new equipment to existing monitoring equipment at the supervising station.
   3. Expand, modify, and supplement existing control or monitoring equipment as necessary to extend existing control or monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.

C. Smoke- or Heat-Detector Spacing:
   1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
   2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
   3. Smooth ceiling spacing shall not exceed 28.
   4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A or Appendix B in NFPA 72.
   5. HVAC: Locate detectors not closer than 5 feet from air-supply diffuser or return-air opening.
   6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

E. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

F. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

G. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

H. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.

J. Device Location-Indicating Lights: Locate in public space near the device they monitor.

K. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.

L. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

3.02 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
3. Smoke dampers in air ducts of designated air-conditioning duct systems.
4. Alarm-initiating connection to elevator recall system and components.
5. Alarm-initiating connection to activate emergency lighting control.
6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
7. Supervisory connections at valve supervisory switches.
8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
9. Supervisory connections at elevator shunt trip breaker.
10. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
11. Supervisory connections at fire-pump engine control panel.

3.03 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.04 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.05 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Architect or authorities having jurisdiction as required by local code.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:
   1. Visual Inspection: Conduct visual inspection prior to testing.
      a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
      b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
   2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
   3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
   4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
   5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
   6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

SECTION 28 31 12FIRE ALARM SYSTEM

(BUILDINGS NO. 2 THRU NO. 9)

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install analog addressable fire alarm system ay facility as indicated on plans and called for hereafter.

B. Each building will have a fire alarm control panel to monitor sprinkler system at facility. In addition, fire alarm control panel will provide power and monitor single-station detectors throughout the building.

C. All fire alarm control panels at site will be interconnected in Class A arrangement with fiber optic cable to main fire alarm control panel located at Building No. 1. This will allow monitoring of site at only one location.

D. Contractor shall submit complete documentation for fire alarm system showing the model number, type, rating, style, manufacturer's names, manufacturer's catalog data sheets, and complete wiring diagrams for all it3ems to insure compliance with these specifications.

1.02 STANDARDS AND LICENSING

A. All equipment and installation shall comply with current applicable provisions of the following standards.

1 NEC Article 760
2 NFPA 72
3 City of Knoxville ordinances and codes.
4 Underwriters Laboratories, Inc.

PART 2 -PRODUCTS

2.01 MATERIALS

A. Each fire alarm control panel shall be addressable and intelligent. Minimum size and quality of panel shall be Silent Knight Model 6700.

B. Provide a Honeywell Model IPGSM-4G wireless communicator and main fire alarm control panel at Building No. 1.

C. Provide fire alarm control panel at each sprinkler riser on project. This will be Silent Knight Model 6700. This module is a transmitter and receiver

D. All fire alarm panels shall contain a Model SK-FML fiber OPTC Multi-Mode module for communications with other panels.

E. Provide monitor models as required for tamper switches and flow switches. Verify exact number required with sprinkler contractor prior to ordering.

F. Smoke detectors on project shall be generally single station in all units. Provide smoke detector, not single-station, at the fire alarm control panel. Single-station smoke detectors shall be System Sensor Model 2251TMB, photoelectric type with 135-degree thermal element. In units, detector shall be mounted on a sounder base, minimum 85 dba, 520 Hz. Base shall be System Sensor B200S-LF.

G. At each sprinkler riser, provide outdoor weatherproof 120-volt horn/strobe unit. Use System Sensor Model P2RHK-120 strobe. Minimum output shall be 177 candela. This strobe shall be connected to local 120-volt power via 2-pole switch at sprinkler system flow switch.

H. For handicapped units where single-station detectors are installed, provide Silent Knight #SWL wall mounted 177 candela strobe.

I. Connect domestic water solenoid valve at each fire alarm riser. Provide fire alarm listed relay and provide sufficient battery power at fire alarm panel to hold solenoid valve open. Solenoid shall be connected to close only upon activation of water flow switch.

J. Fire alarm system shall be programmed so that alarm occurs only upon water flow in building.

K. In each individual apartment, all smoke detectors with sounder bases shall operate upon activation of any single detector in that unit. This shall not cause alarm in any other unit, but

shall sound a trouble at the fire alarm control panel.

PART 3 -EXECUTION

3.01 INSTALLATION

A. Furnish and install in accordance with manufacturer's instructions all wiring and outlet boxes for installation of a complete system as described herein and shown on plans. The installing contractor shall have been engaged in installation of fire alarm systems for a minimum of fi e years prior to award of contract. The installing contractor shall have in his employment more than one employee who is qualified factory trained installer and at least one employee that is NICET Level IV.

B. All wiring to be installed using listed fire alarm cable as recommended by manufacturer. All cable subject to physical damage shall be installed in metal raceway. Installation shall comply with City of Knoxville ordinances and requirements.

C. From each panel proved 1 ¼"c, to building No. 1 and install a 6 strand multi-mode 50 micron fiber, Class A, between townhouse fire alarm panel and fire alarm panel in building No. 1

END OF SECTION

SECTION 31 00 00
EARTHWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Protection, modification, or installation of utilities as site work progresses with particular attention to grade changes and necessary staging or phasing of work.

B. Cutting, filling, and grading to required lines, dimensions, contours, and elevations for proposed improvements.

C. Scarifying, compacting, drying, dewatering and removal of unsuitable material to ensure proper preparation of areas for fills or proposed improvements.

1.02 RELATED SECTIONS

A. Section 312300 – Excavation, Backfill, and Compaction for Structures.

B. Section 312313 – Excavation, Backfill, and Compaction for Pavement.

C. Section 321123 – Aggregate Materials

D. Section 312513 – Slope Protection and Erosion Control

E. The “Foundation Subsurface Preparation” as shown on the Construction Drawings and/or the Architectural-Structural drawings and/or the “Report of Subsurface Exploration”, whichever is more stringent if a conflict exists.

F. Construction Drawings and Report of Subsurface Exploration.

1.03 REFERENCE STANDARDS

A. American Society for testing and Materials (ASTM) latest edition.

1. D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^2) (600 kN.m/m^2).
2. D 1556 Density and Unit Weight of Soil In Place by the Sand-Cone Method.
3. D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^2) (2,700 Kn.m/m^2).
4. D 2167 Density and Unit Weight of Soil In Place by the Rubber Balloon Method.
5. D 2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
6. D 2487 Classification of Soils for Engineering Purposes.
7. D 2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).
8. D 3017 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
9. D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.

1. T 88 Particle Size Analysis of Soils.

1.04 QUALITY ASSURANCE

A. An independent testing laboratory, selected and paid for by Owner, shall be retained to perform construction testing on site.

1. The independent testing laboratory shall prepare test reports that indicate test location, elevation data, and test results. Owner, Civil Engineering Consultant, and Contractor shall be provided with copies of reports within 96 hours of time that test was performed. In event that test performed fails to meet Specifications, Owner and Contractor shall be notified immediately by the independent testing laboratory.

2. Costs related to retesting due to failures shall be paid for by the Contractor at no additional expense to Owner. Contractor shall provide free access to site for testing activities.

1.05 SUBMITTALS

A. Submit 100-pound sample of each type of off-site fill material that is to be used at the site in air tight container(s) for the independent testing laboratory or submit gradation and certification of aggregate material that is to be used at the site to the independent testing laboratory for review.

B. Submit name of each material supplier and specific type and source of each material. Change in source throughout project requires approval of Engineer.

C. If fabrics or geogrids are to be used, design shall be submitted for approval to Engineer.

D. Submit Dewatering Plans upon request by Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Excavated and re-used material for subsoil fill as specified herein.

B. Aggregate fill as specified in Section 321100.

C. Imported fill material approved by Geotechnical Engineer and specified herein.

2.02 EQUIPMENT

A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

2.03 SOURCE QUALITY CONTROL

A. In areas to receive pavement, California Bearing Ratio (CBR) or Limerock Bearing Ratio (LBR) test shall be performed for each type of material that is imported from off-site.

B. Following tests shall be performed as part of construction testing requirements on each type of on-site or imported soil material used as compacted fill:

1. Moisture and Density Relationship: ASTM D 698 (or ASTM D 1557).
2. Mechanical Analysis: AASHTO T 88.
3. Plasticity Index: ASTM D 4318.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Locate and identify existing utilities that are to remain and protect from damage.

C. Notify utility companies to remove or relocate utilities that are in conflict with proposed improvements.

D. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

F. Remove from site, material encountered in grading operations that, in opinion of the Geotechnical Engineer, is unsuitable or undesirable for backfilling, subgrade, or foundation purposes. Dispose of in a legal manner and a manner. Backfill areas with layers of suitable material and compact as specified herein.

G. Prior to placing fill in low areas, such as previously existing creeks, ponds, or lakes, perform following procedures:

1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain the same results.
2. After drainage of low area is complete, remove mulch, mud, debris, and other unsuitable material by using acceptable equipment and methods that will keep natural soils underlying low areas dry and undisturbed.
3. If proposed for fill, muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation by Geotechnical Engineer. Material shall be inspected and, if found to be suitable for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under building subgrade or within 10’-0” of perimeter of building subgrade, retaining wall subgrade or paving subgrade. If, after observation by Geotechnical Engineer, material is found to be unsuitable, unsuitable material shall be removed from site.

H. Dewatering:

1. General:
   a. Design and provide dewatering system using accepted and professional methods consistent with current industry practice to eliminate water entering the excavation under hydrostatic

head from the bottom and/or sides. Design system to prevent differential hydrostatic head which would result in floating out soil particles in a manner termed as a “quick” or “boiling” condition. System shall not be dependent solely upon sumps and/or pumping water from within the excavation where differential head would result in a quick condition, which would continue to worsen the integrity of the excavation’s stability.

b. Provide dewatering system of sufficient size and capacity to prevent ground and surface water flow into the excavation and to allow all Work to be installed in a dry condition.

c. Control, by acceptable means, all water regardless of source and be fully responsible for disposal of the water.

d. Confine discharge piping and/or ditches to available easement or to additional easement obtained by Contractor. Provide necessary permits and/or additional easement at no additional cost to Owner.

e. Control groundwater in a manner that preserves strength of foundation soils, does not cause instability or raveling of excavation slopes, and does not result in damage to existing structures. Where necessary to these purposes, lover water level in advance of excavation, utilizing wells, wellpoints, jet educators, or similar positive methods. The water level as measured by piezometers shall be maintained a minimum of 3 feet below prevailing excavation level.

f. Commence dewatering prior to any appearance of water in excavation and continue until Work is complete to the extent that no damage results from hydrostatic pressure, flotation, or other causes.

g. Open pumping with sumps and ditches shall be allowed, provided it does not result in boils, loss of fines, softening of the ground, or instability of slopes.

h. Install wells and/or wellpoints, if required, with suitable screens and filters, so that continuous pumping of fines does not occur. Arrange discharge to facilitate collection of samples by the Owner. During normal pumping, and upon development of well(s), levels of fine sand or silt in the discharge water shall not exceed 5 ppm. Install sand tester on discharge of each pump during testing to verify that levels are not exceeded.

i. Control grading around excavations to prevent surface water from flowing into excavation areas.

j. No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head.

2. Design:

a. Contractor shall designate and obtain the services of a qualified dewatering specialist to provide dewatering plan as may be necessary to complete the Work.

b. Contractor shall be responsible for the accuracy of the drawings, design data, and operational records required.

c. Contractor shall be solely responsible for the design, installation, operation, maintenance, and any failure of any component of the system.

3. Damages:

a. Contractor shall be responsible for and shall repair without cost to the Owner any damage to work in place, or other contractor's equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation, including, damage to the bottom due to heave and including but not limited to, removal and pumping out of the excavated area that may result from Contractor's negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.

b. Remove subgrade materials rendered unsuitable by excessive wetting and replace with approved backfill material at no additional cost to the Owner.

4. Maintaining Excavation in Dewatering Condition:

a. Dewatering shall be a continuous operation. Interruptions due to power outages or any other reason will not be permitted.

b. Continuously maintain excavation in a dry condition with positive dewatering methods during preparation of subgrade, installation of pipe, and construction of structures until the critical period of construction and/or backfill is completed to prevent damage of subgrade support, piping, structure, side slopes, or adjacent facilities from flotation or other hydrostatic pressure imbalance.

c. Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the event any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, perform such work as may be required to restore damaged structures and foundation soils at no additional cost to Owner.

d. System maintenance shall include but not be limited to 24-hour supervision by personnel skilled in the operation, maintenance, and replacement of system components and any other work required to maintain excavation in dewatered condition.

5. System Removal:

a. Remove dewatering equipment from the site, including related temporary electrical service.

b. Wells shall be removed or cut off a minimum of 3 feet below final ground surface, capped, and abandoned in accordance with regulations by agencies having jurisdiction.

3.02 EXCAVATION FOR FILLING AND GRADING

A. Classification of Excavation: Contractor acknowledges that site has been investigated to determine type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified excavation, except as indicated in the Contract Documents.

B. When performing grading operations during periods of wet weather, provide adequate dewatering, drainage and ground water management to control moisture of soils.

C. Shore, brace, and drain excavations as necessary to maintain excavation as safe, secure, and free of water at all times.

D. Excavated material containing rock or stone greater that 6-inches in largest dimension is unacceptable as fill within proposed building subgrade and paving subgrade.

E. Rock or stone less than 6-inches in largest dimension is acceptable as fill to within 24-inches of surface of proposed subgrade when mixed with suitable material.

F. Rock or stone less than 2-inches in largest dimension and mixed with suitable material is acceptable as fill within the upper 24-inches of proposed subgrade.

3.03 FILLING AND SUBGRADE PREPARATION

A. Fill areas to contours and elevations shown on Construction Drawings with unfrozen materials.

B. Place fill in continuous lifts specified in Geotechnical Report.

C. Refer to Section 312300 and Geotechnical Report for filling requirements for structures.

D. Refer to Section 312313 and Geotechnical Report for filling requirements for pavements.

E. Areas exposed by excavation or stripping and on which subgrade preparations are to be performed shall be scarified to minimum depth of 8-inches and compacted as per the geotechnical report included herein.

F. Fill materials used in preparation of subgrade shall be placed as per the geotechnical report.

G. Material imported from off-site shall have CBR value equal to or above pavement design subgrade CBR value indicated in the geotechnical report.

3.04 MAINTENANCE OF SUBGRADE

A. Verify finished subgrades to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks, dump trucks, and other construction equipment.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements by use of material equal to or better than best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.05 BORROW AND SPOIL SITES

A. Contractor shall be responsible for compliance with NPDES and local erosion control permitting requirements for any and all off-site, disturbed spoil and borrow areas. Upon completion of spoil and/or borrow operations, clean up spoil and/or borrow areas in a neat and reasonable manner to the satisfaction of property owner, Owner, and Civil Engineering Consultant.

3.06 RIP-RAP

A. This work shall consist of furnishing and setting or placing rubble stone, crushed stone, concrete blocks, sacked sand-cement or machined rip-rap. Slope pavement shall consist of the construction of a reinforced concrete mat on prepared slopes. Construction shall be in reasonable close conformity to the lines, grades, dimensions, typical details and sizes shown on the drawings or as directed by the Engineer.

B. All materials used in this construction, in addition to the general requirements of these Specifications, unless otherwise stipulated, shall conform to the following:

1. Rip-rap and slope pavement shall conform to Subsection 709 of the Tennessee Department of Transportation, Standard Specifications for Road and Bridge Construction, 1981 or latest revisions.

3.07 FINISH GRADING

A. Grade areas where finish grade elevations or contours are indicated on Construction Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10-feet above or below established finished subgrade elevation. Ground surfaces shall vary uniformly between indicated elevations. Grade finished ditches to allow for proper drainage without ponding and in manner that will minimize erosion potential.

B. Correct settled and eroded areas within 1 year after date of completion at no additional expense to Owner. Bring grades to proper elevation. Replant or replace grass, shrubs, bushes, or other vegetation that appears dead, dying, or disturbed by construction activities. Refer to Section 312513 for slope protection and erosion control.

3.08 FIELD QUALITY CONTROL

A. Field density tests for in-place materials shall be performed as part of construction testing requirements according to one of the following standards:

1. Sand-Cone Method: ASTM D 1556.
2. Balloon Method: ASTM D 2167.
3. Nuclear Method: ASTM D 2922 (Method B-Direct Transmission).

B. Perform density test as follows:

1. Building Subgrade Areas, Including 10'-0" Outside of Exterior Building Lines: In cut areas, not less than 1 compaction test for every 2,500 sq. ft. In fill areas, same rate of testing for each 6-inch lift, measured loose.
2. Areas of Construction Exclusive of Building Subgrade Areas: In cut areas, not less than 1 compaction test for every 10,000 sq. ft. In fill areas, same rate of testing for each 6-inch lift, measured loose.

C. Corrective measures for non-complying compaction:

1. Remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of site clearing is shown on drawings.

1.03 JOB CONDITIONS

A. Traffic: Conduct site clearing operations to insure minimum interference with roads, streets, walks and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place. Protect improvements on adjoining properties and on Owner's property. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

C. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.

1. Provide protection for roots over 1 ½" diameter cutting during construction operations. Coat cut faces with emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
2. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations.
3. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.01 GENERAL

A. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions interfering with installation of new construction. Remove such items elsewhere on site or premises as specifically indicated. Removal includes digging out stumps and roots.

1. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction. Use only hand methods for clearing and grubbing inside drip line of trees indicated to be left standing.

3.02 TOPSOIL

A. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2" in diameter, and without weeds, roots and other objectionable material.

1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
2. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to main root system.
3. Stockpile topsoil in storage piles. Construction storage piles to freely drain surface water. Dress stockpiled soil in accordance with section Stormwater Pollution Prevention Plan.

3.03 REMOVAL OF IMPROVEMENTS

A. Remove existing above-grade and below-grade improvements necessary to permit construction. Abandonment or removal of certain underground pipe or conduits may be shown on mechanical or electrical drawings, and is included under work of those sections. Removal of abandoned underground piping or conduit interfering with construction is included under this section.

3.04 DISPOSAL OF WASTE MATERIALS

A. Dispose of materials in a legal manner.

END OF SECTION

SECTION 31 22 19
FINISH GRADING

PART 1 GENERAL

1.01 The work called for by this section shall include, but not necessarily be limited to, finish grading and the spreading and shaping of topsoil to the finished contour elevations indicated by the drawings.

1.02 Refer to other sections for work related to that specified under this heading. Coordinate this work with that specified by other sections for timely execution.

PART 2 PRODUCTS

2.01 TOPSOIL

A. Use existing topsoil from site that was stripped and stockpiled prior to excavation and filling activities.

PART 3 EXECUTION

3.01 Do not begin work until the earth is dry enough to be tillable.

3.02 Inspect subgrades to see that they generally conform to the standards called for elsewhere in these specifications, particularly with regard to the approximate depths required for the work. After work is completed, inspect it to ensure that all finish grading complies with design requirements.

3.03 Place finished grade stakes wherever necessary to bring the work accurately to the elevations required by the drawings.

3.04 Finish grade all areas outside the building line to the depths Required for the work as follows:

3.05 Grade uniformly with rounded surfaces at the tops and bottom of abrupt changes of plans.

A. Hand grade steep slopes and areas that are inaccessible for machine work.

B. Protect graded areas from undue erosion, and repair and re-grade areas where erosion does occur.

C. Refill areas where noticeable settlement has occurred.

D. Finish grade areas that are to receive topsoil up to 4 inches below the finished contour elevations called for by the drawings or, over rock, to 12 inches below these elevations.

3.06 Place topsoil uniformly over disturbed areas that do not receive other work as follows.

A. Obtain approval of the finish grading from the A/E before starting to place topsoil.

B. Scarify subgrade to a depth of 6 inches.

C. Place the topsoil to a depth of 4 inches when lightly rolled or, on rock, to a depth of 12 inches.

D. Level the topsoil so that it slopes uniformly and has no water pockets.

E. Carefully rake the topsoil by hand to remove all clods, roots, sticks, stones over 1 inch in diameter, and other foreign materials from the surface.

3.07 Dispose of excess excavated materials and debris away from the site in a legal manner.

END OF SECTION

SECTION 31 23 00
EXCAVATION AND FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavation to line, grade, and configuration as shown on Construction Drawings for proposed structures and future expansion areas.

B. Fill to line, grade, and configuration as shown on Construction Drawings for proposed structures and future expansion areas.

C. Compacting for materials in acceptable manner as specified herein.

1.02 RELATED SECTIONS

A. Section 311123 – Aggregate Material

B. The “Foundation Subsurface Preparation” as shown on the Construction Drawings and/or the Architectural-structural drawings and/or the “Report of Subsurface Exploration”, whichever is more stringent.

C. Construction drawings and Report of Subsurface Exploration.

1.03 REFERENCE STANDARDS

A. See Section 310000

1.04 QUALITY ASSURANCE

A. An independent testing laboratory, selected and paid for by Owner, shall be retained to perform construction testing on filling operations and subgrade analysis as specified in Section 310000 and as specified herein.

1.05 SUBMITTALS

A. Shop drawings or details pertaining to excavating and filling for structures are not required unless otherwise shown on Construction Drawings or if contrary procedures to Contract Documents are proposed.

B. Submit 100-pound sample of each type of off-site fill material that is to be used in backfilling in air-tight container(s) to the Owner’s representative or submit gradation and certification of aggregate material that is to be used at the site to the Owner’s representative for independent testing laboratory to review.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill material from on-site as specified in Section 310000 and approved by Geotechnical Engineer.

B. Fill material from off-site as specified in Section 310000 and approved by Geotechnical Engineer.

C. Aggregate material as specified in Section 321123.

2.02 EQUIPMENT

A. Transport off-site materials to the project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify lines, elevations, and grades necessary to construct building subgrades as shown on Construction Drawings.

B. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

C. Locate and identify utilities that have previously been installed and protect from damage.

D. Locate and identify existing utilities that are to remain and protect from damage.

E. Over excavate and properly prepare areas of subgrade that are not capable of supporting proposed structures per the Construction drawings, the geotechnical report, or the Owner's representative. Stabilize these areas per the documents discussed previously.

3.02 EXCAVATION

A. Excavate building areas to line and grade as shown on Construction Drawings being careful not to over excavate beyond elevations needed for building subgrades.

B. Place suitable excavated material into project fill areas as specified in Section 312300.

C. Unsuitable excavated material is to be disposed off-site of in a legal manner.

D. Perform excavation using capable, well-maintained equipment and methods acceptable to Owner and local governing agencies.

3.03 FILLING AND SUBGRADE PREPARATION

A. Building area subgrade pad shall be that portion of site directly beneath and 10-feet beyond building and appurtenances, including limits of future building expansion areas as shown on Construction Drawings.

B. Prepare building area subgrade pad in strict accordance with "Foundation Subsurface Preparation" as shown on the Construction Drawings and/or the architectural-structural

drawings, whichever is more stringent. Rock larger than 6-in. shall not be part of building subgrade fill.

C. Areas exposed by excavation or stripping and on which building subgrade preparations are to be performed shall be scarified to a minimum depth of 8-inches and compacted as per the geotechnical report included herein.

Place fill materials used in preparation of subgrade as per the geotechnical report included herein.

3.04 COMPACTION

A. Maintain optimum moisture content as specified above of fill materials to attain required compaction density.

B. Test materials in accordance with Section 310000.

C. Corrective measures for non-compaction: Remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner.

D. Minimum compaction requirements are 98% of the Standard Proctor Test.

3.05 MAINTENANCE OF SUBGRADE

A. Verify finished subgrades to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks, dump trucks, and other construction equipment.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements by use of materials equal to or better than best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.06 FINISH GRADING

A. Finish grading shall be in accordance with Section 312219 and as more specifically specified herein.

B. Check grading of building subgrades by string line from grade stakes (blue tops) set at not more than 50-foot centers. Tolerances of 0.10-feet, more or less, will be permitted. Contractor to provide engineering and field staking necessary for verification of lines, grades, and elevations.

END OF SECTION

SECTION 31 23 13
EXCAVATION, BACKFILL AND COMPACTION FOR PAVEMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavation to line, grade, and configuration as shown on Construction Drawings for proposed and future pavement areas.

B. Fill to line, grade, and configuration as shown on Construction Drawings for proposed and future pavement areas.

C. Compacting fill materials in acceptable manner as specified herein.

1.02 RELATED SECTIONS

A. Section 310000 – Earthwork

B. Section 321123 – Aggregate Materials

C. Construction Drawings and Report of Subsurface Exploration.

1.03 REFERENCE STANDARDS

A. See Section 310000.

1.04 QUALITY ASSURANCE

A. Independent Testing Laboratory, selected and paid by the Owner, shall be retained to perform construction testing on filling operations and subgrade analysis as specified in Section 310000 and as specified herein.

1.05 SUBMITTALS

A. Shop drawings or details pertaining to excavating and filling for pavements are not required unless otherwise shown on Construction Drawings or if contrary procedures to Construction Documents are proposed.

B. Submit 100-pound sample of each type of off-site fill material that is to be used in backfilling in air-tight container to independent testing laboratory or submit gradation and certification of aggregate material that is to be used to independent testing laboratory for review.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill material from on-site as specified in Section 310000 and approved by Geotechnical Engineer.

B. Fill material from off-site as specified in Section 310000 and approved by Geotechnical Engineer.

C. Aggregate material as specified in Section 321123.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify lines, elevations, and grades necessary to construct pavements, curb, curb and gutter, bases, sidewalk, and roadways as shown on Construction Drawings.

B. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

C. Locate and identify site utilities that have previously been installed and protect from damage.

D. Locate and identify existing utilities that are to remain and protect from damage.

E. Over excavate and properly prepare areas of subgrade that are not capable of supporting proposed systems. Stabilize these areas by using acceptable geotextile fabrics or aggregate material placed and compacted as described in Soils Report.

3.02 EXCAVATION

A. Excavate roadway and pavement areas to line and grade as shown on Construction Drawings.

B. Place suitable material into project fill areas as specified in Section 310000.

C. Unsuitable excavated material is to be disposed of in a legal manner.

D. Perform excavation using capable, well-maintained equipment and methods acceptable to Owner and local governing agencies.

3.03 FILLING AND SUBGRADE PREPARATION

A. Areas exposed by excavation or stripping and on which subgrade preparations for paving are to be performed, including future pavement areas, shall be scarified to minimum depth of 8-inches and compacted and proof roll as per the geotechnical report included herein. Excavate and recompact areas of failure as specified herein. Continual failure areas shall be stabilized in accordance with Section 312300 at no additional cost to Owner.

B. Place fill materials used in preparation of the subgrade in lifts or layers not to exceed 6-inches loose measure and compact as per the geotechnical report included herein.

C. Fill Material imported from off-site or fill material removed from onsite cut areas shall have CBR value equal to or greater than pavement design subgrade CBR value indicated in geotechnical report.

3.04 COMPACTION

A. Maintain optimum moisture content of fill materials as specified herein to attain required compaction density.

B. Test materials in accordance with Section 310000.

C. Compaction within pavement areas shall achieve 100% of the Standard Proctor Test.

D. Corrective measures for non-complying compaction: Remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner.

3.05 MAINTENANCE OF SUBGRADE

A. Verify finished subgrades to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction including concrete trucks, dump trucks, and other construction equipment.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements by use of material equal to or better than best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.06 FINISH GRADING

A. Finish grading shall be in accordance with Section 312219 and as specified herein.

B. Check grading of paving areas by string line from grade stakes (blue tops) set at not more than 50-foot centers. Tolerances of 0.10-foot, more or less, will be permitted. Contractor is to provide engineering and field staking necessary for verification of lines, grades, and elevations.

END OF SECTION

SECTION 31 23 16.13
FACILITY UTILITIES EXCAVATING AND BACKFILLING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Excavate and backfill trenches for all piping except irrigation system.

1.02 RELATED WORK

A. Section 014000 - Quality Control

1. Testing Laboratory Services.

B. Section 310000 - Earthwork.

C. Section 334000 - Storm Drainage.

D. Section 334900 - Storm Drainage Structures

1.03 QUALITY ASSURANCE

A. Comply with requirements of local Department of Public Works.

B. Obtain required permits and notices.

1.04 PROTECTION

A. Shore and brace excavations to prevent caving as required.

B. Provide surface drainage to keep excavations clear of water. Pump if required.

C. Protect all existing on-site utilities, and City utilities at project site property lines.

1.05 COORDINATION

A. Coordinate with other trades affected by this work.

B. Schedule trench excavations so that pipes passing under foundations are in place and trenches are properly backfilled before foundations are placed.

PART 2 PRODUCTS

2.01 AGGREGATES

A. Crushed stone or clean natural gravel: ASTM D448, No. 6

B. Sand: ASTM C144.

2.02 EARTH FILL

A. Earth: Clean selected clay, silty clay, or sandy clay.

2.03 POLYETHYLENE LINER

A. Black polyethylene, 6 mils thick, minimum, or approved equal.

2.04 MULCH

A. Clean coarse hay.

PART 3 EXECUTION

3.01 EXCAVATING ROCK

A. When rock is encountered which cannot be removed with backhoe and powered shovel, obtain instructions from Geotechnical Engineer before proceeding.

B. In excavated areas, backfill with aggregate and thoroughly compact.

3.02 EXCAVATING TRENCHES

A. Trenches may be excavated with trenching machines and backhoes, except as otherwise specified below.

B. Unless otherwise indicated, excavate trenches outside of building to a depth which will allow placement of pipes below frost line, but in no case less than 2’-0” cover.

C. Trenches which cross foundations inside of building, excavate to a depth which will allow placement of top pipes to hold pitch and meet connection points.

D. Service lines inside of building serving as distribution lines to individual fixtures may be placed in aggregate fill below concrete slab-on-grade, as specified below. Electric conduit below slabs-on-grade may be similarly placed.

E. Excavate trenches for bell hubbed pipe wide enough to allow for proper jointing, bedding, and visual inspection of at least the top half of pipe.

1. Excavate the bottom 6 inches of trenches with hand tools and make uniformly smooth. Scoop out bell holes so that the barrel of each length of pipe is uniformly supported.
2. Excavate trenches in rock 6 inches and backfill with sand to allow pipe to lay on sand bed.
3. Provide the following slopes on sewer and drain lines unless shown otherwise:
   a. Inside of building: 1/4” to 1’-0".
   b. Outside of building: 1/8” to 1’-0".

F. Earth Trenches for Copper, PVC, and Galvanized Pipe, and Electrical Conduit shall be excavated to a depth of 6 inches below bottoms of pipes in final position and backfill with sand. Tamp sand to settle it and provide smooth surface to uniformly support pipe. Trenches may be narrow provided pipes can be properly bedded, connected, and inspected.

G. Sewer and Water Line Trenches:

1. Provide separate trenches. Allow at least 10 feet of undisturbed earth or controlled fill between sewer and waterlines.
2. Where sewer and waterlines are within 10 feet of each other, and where they cross, place sewer lines at least 18 inches below water lines.

3.03 PLACING PIPES IN FILL AGGREGATE

A. Cast iron, vitreous clay, and concrete pipe may be placed directly into trenches furrowed out in fill aggregate, but tops of piping shall be below bottoms of concrete slabs.

B. Where copper, PVC, corrugated metal pipe, or black pipe and electrical conduit are placed in fill, furrow out trenches to a depth which will allow tops of pipes to be below bottoms of concrete slabs after the following bedding is done. Line trenches in fill with a double layer of polyethylene sheeting; place at least 3" of sand on top of felt and tamp it smooth. After pipe is installed, back-fill over top of pipe with sand at least 3" deep, backfill to level of tip of fill.

3.04 BACKFILLING TRENCHES

A. Do not backfill utility trenches until pipes are installed, tested and approved.

3.05 PIPING OUTSIDE OF BUILDING

A. Cast iron, vitreous clay, corrugated pipe, and concrete pipe: Backfill with aggregate to 6” below adjacent grades in areas designated as lawns or plantings and place a thin dense layer of hay and finish backfilling with earth fill. Areas paved or covered by their construction shall be back-filled with aggregate to level of adjacent grades. In placing aggregate fills, work along sides and under bottom half to fully support pipes; then place fill on top of pipes in 8" lifts and tamp each lift for compaction.

B. Copper, PVC or black pipe and electrical conduit: Backfill with sand over tops of pipes. Use hand tools to backfill and compact sand along sides and bottoms of pipes to ensure their support. After sand has been tamped, backfill with aggregate and earth (as specified above for cast iron pipe) in areas designated as lawns or planted. In paved areas backfill as specified above for cast iron pipe.

3.06 BACKFILLING PITS

A. Do not backfill pits until installed items have been completed and tested.

B. Concrete masonry and cast iron items: Backfill with coarse aggregate. Place aggregate in one foot layers and compact each layer after placing. Where items are placed in lawn areas, fill with aggregate to one foot below adjacent grades, cover with straw or paper, and finish backfilling to grade with fill earth. Tamp and compact earth fill to the same density as adjacent grade materials. Where items are placed in areas covered by paving or other hard surfaced construction, fill with coarse aggregate to existing grades.

3.07 CLEAN-UP

A. After other work of this Section is completed, leave area clean and free of debris.

B. Remove excess earth and rock remaining after backfill is completed from job site.

END OF SECTION

SECTION 31 25 13
SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Installation of temporary and permanent erosion control systems.

B. Installation of temporary and permanent slope protection systems.

1.02 RELATED SECTIONS

A. Section 310000 – Earthwork

B. Construction Drawings

C. Subsection 209 TDOT, standard specifications

D. Tennessee Department of Environment and Conservation Erosion and Sediment Control Handbook

1.01 ENVIRONMENTAL REQUIREMENTS

A. Protect adjacent properties and water resources from erosion and sediment damage throughout life of contract.

PART 2 PRODUCTS

2.01 MATERIALS

A. Quick growing grasses as specified in Construction Drawings.

B. Hay or straw bales as specified in Construction Drawings.

C. Fencing for siltation control as specified on Construction Drawings.

D. Curlex blankets by American Excelsior Company or approved equal.

E. Bale stakes as specified in Construction Drawings.

F. Temporary mulches such as loose hay, straw, netting, wood cellulose, or agricultural silage.

G. Fence stakes shall be as specified in Construction Drawings.

PART 3 EXECUTION

3.01 PREPARATION

A. Review Construction Drawings and Storm Water Pollution Prevention Plan.

B. Deficiencies or changes on Construction Drawings or Storm Water Pollution Prevention Plan as it is applied to current conditions shall be brought to the attention of Engineer for remedial action.

3.02 EROSION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

A. Place erosion control systems in accordance with Construction Drawings and Storm Water Pollution Prevention Plan (SWPPP) or as may be dictated by site conditions in order to maintain the intent of the specifications and permits at no additional cost to Owner.

B. Engineer has authority to limit surface area of erodible earth material exposed by cleaning and grubbing, excavation, borrow and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures. Contractor will be required to incorporate permanent erosion control features into project at earliest practical time to minimize need for temporary controls. Permanently seed and mulch cut slopes as excavation proceeds to extent considered desirable and practical.

C. Maintain temporary erosion control systems as directed by Engineer or governing authorities to control siltation during life of contract. Contractor shall respond to maintenance or additional work ordered by Engineer or governing authorities within 48 hours or sooner if required.

D. Slopes that erode easily or that will not be graded for a period of 14 days or more shall be temporarily seeded as work progresses with Kentucky 31 Fescue application unless otherwise specified on the Construction Drawings.

E. In the event that site work on this project will disturb one or more acres; the Contractor shall not begin construction without submitting a “Notice of Intent” as required by the Tennessee General Permit No TNR 10-0000, Construction General Permit (TNCGP) for Storm Water Discharges from Construction Activities. No construction activity shall begin until a “Notice of Coverage” (NOC) is received from the Tennessee Department of Environment and Conservation.

F. The contractor shall be totally responsible for conducting storm water management practices in accordance with the TNCGP, the Tennessee Erosion & Sediment Control Handbook, and the WWPPP and for enforcement action taken by or imposed by Federal or State agencies, including the cost of fines, construction delays, and remedial action resulting from the Contractor’s failure to comply with the provisions of the TNCGP.

END OF SECTION

SECTION 32 11 00
PAVING BASE COURSE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction of granular base for asphaltic concrete and portland cement concrete paving.

B. Construction of sand/shell base for asphaltic concrete and portland cement concrete paving.

C. Construction of full depth asphalt base for asphaltic concrete paving.

D. Construction hot-mix sand asphalt base for asphaltic concrete paving.

E. Construction of soil cement stabilized base for asphaltic concrete and portland cement concrete paving.

1.02 RELATED SECTIONS

A. Section 310000 – Earthwork

B. Section 312313 – Excavation, Backfill, and Compaction for Pavement

C. Section 321123 – Aggregate Materials

D. Section 321600 – Curbs and Sidewalks

E. State Highway Department Standard Specifications

F. City of Knoxville Standard Specifications

G. Construction Drawings

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) latest edition.

1. D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort. (12,400 ft-lbf/ft^2) (600 kN.m/m^2)
2. D 1556 Density and Unit Weight of Soil In Place by the Sand-Cone Method.
3. D 1557Laboratory Compaction Characteristics of Soil Using Modified Effort. (56,000 ft-lbf/ft^2) (2,700 kN.m/m^2)
4. D 2167 Density and Unit Weight of Soil In Place by the Rubber Balloon Method.
5. D 2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
6. D 2487 Classification of Soils for Engineering Purposes.
7. D 2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)
8. D 3017 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

9. D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

B. American Association of State Highway and Transportation Official (AASHTO) latest edition

1. T88 Particle Size Analysis of Soils

1.04 QUALITY ASSURANCE

A. An independent testing laboratory selected and paid by Contractor, will be retained to perform construction testing of in-place base course for compliance with requirements for thickness, compaction, density, and tolerances. Paving base course tolerances shall be verified by rod and level readings on not more than 50-foot centers to be not more than 0.05 feet above design elevation which will allow for paving thickness as shown on Construction Drawings. Contractor shall provide instruments and suitable benchmark.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Submit materials certificate to the independent testing laboratory which is signed by materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein.

2.02 **SOURCE QUALITY CONTROL**

A. Following test will be performed on each type of material used as base course material:

1. Moisture and Density Relationship: ASTM D 698 (or ASTM D 1557).
2. Mechanical Analysis: AASHTO T 88.
3. Plasticity Index: ASTM D 4318.
4. Base material thickness: Perform 1 test for each 20,000 sq. ft. of in-place base material area.
5. Base material compaction: Perform 1 test in each lift for each 20,000 sq. ft. of in-place base material area.
6. Test each source of base material for compliance with state highway department specifications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall verify to the Owner in writing that the subgrade has been inspected, tested, and gradients and elevations are correct, dry, and properly prepared in accordance with the requirements of applicable state highway department specifications section(s) referred to or noted on the Construction Drawings.

3.02 CONSTRUCTION

A. Construction shall meet or exceed requirements of this Section and applicable state highway department specifications section(s) referred to or noted on the Construction Drawings which pertain to aggregate base course design, materials, preparation, and execution. Materials shall be as indicated on Construction Drawings and shall comply with state highway department specifications regarding source, quality, gradation, liquid limit, plasticity index, and mix proportioning.

3.03 FIELD QUALITY CONTROL

A. Field density tests for in-place materials shall be performed in accordance with one of following standards:

1. Sand-Cone Method: ASTM D 1556.
2. Balloon Method: ASTM D 2167.
3. Nuclear Method: ASTM D 2922 (Method B-Direct Transmission).

B. The independent testing laboratory will prepare reports that indicate test location, elevation data, and test results. Owner and Contractor shall be provided with copies of the reports within 96 hours of the time the test was performed. In the event that the test results show failure to meet any of the Specifications; Owner and Contractor will be notified immediately by the independent testing laboratory.

C. Costs related to retesting due to failures shall be paid for by Contractor at no additional expense to Owner. Contractor shall provide free access to the site for testing activities.

END OF SECTION

SECTION 32 11 23
AGGREGATE MATERIALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate materials for use as specified in other sections.

1.02 RELATED SECTIONS

A. Section 310000 – Earthwork

B. Section 312300 – Excavation, Backfill, and Compaction for Structures

C. Section 312313 – Excavation, Backfill, and Compaction for Pavement

D. Section 312513 – Slope Protection and Erosion Control

E. Construction Drawings and Report of Subsurface Exploration

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition.

1. D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort. (12,400 ft-lbf/ft^2)(600 kN.m/m^2)
2. D 1556 Density and Unit Weight of Soil In Place by the Sand-Cone Method.
3. D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort. (56,000 ft-lbf/ft^2) (2,700 kN.m/m^2)
4. D 2167 Density and Unit Weight of Soil In Place by the Rubber Balloon Method.
5. D 2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
6. D 2487 Classification of Soils for Engineering Purposes.
7. D 2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)
8. D 3017 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
9. D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.

1. TT 88 Particle Size Analysis of Soils

1.04 QUALITY ASSURANCE

A. Tests and analysis of aggregate materials will be performed in accordance with ASTM and AASHTO procedures specified herein.

1.05 SUBMITTALS

A. Submit 100-pound sample of each aggregate or mixture that is to be incorporated into project in air-tight containers to the Owner for submittal to an independent testing laboratory or submit gradation and certification of aggregate material that is to be incorporated into project to the Engineer for review.

B. Submit name of each material supplier and specific type and source of each material. Any change in source requires approval of Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Construction and materials shall meet or exceed requirements of this Section and applicable state highway department specifications section(s) referred to or noted on the Construction Drawings which pertain to paving base course design, materials, preparation, and execution. Materials shall be as indicated on Construction Drawings and shall comply with state highway department specifications regarding source, quality, gradation, liquid limit, plasticity index, and mix proportioning.

2.02 EQUIPMENT

A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger any improvements by rutting, overloading, or pumping.

PART 3 EXECUTION

3.01 STOCKPILING

A. Stockpile on-site at locations indicated by Owner in such manner that there will be no standing water or mixing with other materials.

3.02 BORROW AND SPOIL SITES

A. Upon completion of borrow and/or soil operations, clean up borrow and/or soil areas as indicated on Construction Drawings in neat and reasonable manner to satisfaction of property owner and Owner.

END OF SECTION

SECTION 32 12 16
ASPHALT CONCRETE PAVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of Asphalt concrete paving work is shown on the drawings.

B. Clearing, earthwork and prepared aggregate subbase is specified in earthwork sections.

1.03 SUBMITTALS

A. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with “Standard Specifications for Road and Bridge Construction” by the Tennessee Department of Transportation, latest edition, and with City of Knoxville regulations if more stringent than herein specified.

1.05 JOB CONDITIONS

A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50 degrees F. (10 degrees C.), and when temperature has not been below 35 degrees F. (1 degree C.) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphalt concrete surface course when atmospheric temperature is above 40 degrees F. (4 degrees C.) and when base is dry. Base course may be placed when air temperature is above 30 degrees F. (-1 degree C.) and rising.

C. Grade Control: Establish and maintain required grades and elevations.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Use locally available materials and gradations, which exhibit a satisfactory record of previous installations.

B. Materials shall meet or exceed requirements of this Section and applicable state highway department specifications section(s) referred to or noted on the Construction Drawings which pertain to paving design, materials, preparation, and execution. Materials shall be as indicated on

Construction Drawings and shall comply with state highway department specifications regarding source, quality, gradation, liquid limit, plasticity index, and mix proportioning.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

A. Remove loose material from compacted subbase surface immediately before applying herbicide treatment or prime coat.

B. Proof roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

C. Notify General Contractor of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

D. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase prior to application of prime coat.

E. Prime Coat: Apply as indicated on Construction Drawings, over compacted subgrade. Apply material to penetrate and seal, but not flood surface. Cure and dry as long as necessary to obtain penetration and evaporation of volatile gases.

F. Tack Coat: Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at a rate indicated on Construction Drawings. Allow to dry until at proper condition to receive paving.

G. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

3.02 PLACING MIX

A. General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225 degrees F. (107 degrees C.). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

B. Paving Placing: Place in strips not less than 10' wide, unless otherwise acceptable to Architect. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

C. Joints: Make joints between old and new pavement, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean compact surfaces and apply tack coat.

3.03 ROLLING

A. General: Begin rolling when mixture will bear roller weight without excessive displacement.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced area by loosening and filling, if required, with hot material.

D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.04 TRAFFIC AND LANE MARKINGS

A. Cleaning: Sweep and clean surface to eliminate loose material and dust.

B. Striping Use chlorinated rubber base traffic lane-marking paint, factory-mixed, quick drying, and non-bleeding. Color: White

C. Do not apply traffic and lane-marking paint until layout and placement has been verified by the Architect.

D. Apply paint with mechanical equipment to produce uniform straight edges. Apply in 2 coats at manufacturer's recommended rates.

3.05 FIELD QUALITY CONTROL

A. General: Test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Engineer.

B. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

Base course: ½", plus or minus

Surface course: ¼”, plus or minus.

C. Surface smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10’ straightedge applied parallel with, and at the right angles to center line of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.

Base Course Surface: ¼”

Wearing Course Surface: 3/6”

Crowned Surfaces: Test with crowned template centered and at right angle to crown.

Maximum allowable variance from template: ¼”.

D. Check surface areas at intervals as directed by Engineer.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVEMENT PATIOS

PART 1 GENERAL

1.01 SUMMARY

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to furnish and install reinforced concrete pavement, banding, and decorative colored/stained concrete patios and walks, as indicated on the Contract Documents and as specified herein.

1.02 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Division 1 Section: QUALITY REQUIREMENTS, Testing and Inspection
2. Division 2 Section: DEMOLITION; Saw cutting and removal of existing concrete pavement, where indicated
3. Division 2 Section: EARTH MOVING; Excavation and backfill and establishment of subgrade elevations
4. Division 7 Section: JOINT SEALERS

1.03 REFERENCES

A. The following standards shall apply to the work of this Section.

1. American Concrete Institute (ACI):

   306R Cold Weather Concreting

   316R Recommendations for Construction of Concrete Pavements and Concrete Bases.

2. American Society for Testing and Materials (ASTM):

   A 185 Specification for Steel Welded Wire Fabric. Plain, for Concrete Reinforcement

   A 615 Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement

   C 33 Specifications for Concrete Aggregates

   C 94 Specifications for Ready-Mixed Concrete

   C 143 Test Method for Slump of Hydraulic Cement Concrete

   C 150 Specification for Portland Cement

   C 171 Specification for Sheet Materials for Curing Concrete

   C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

   C 309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete

   C 494 Specification for Chemical Admixtures for Concrete

   C 1116 Standard Specification for Fiber Reinforced Concrete & Shotcrete

   D 226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

   D 545 Test Methods for Preformed Expansion Joint Fillers for Concrete Construction (Non-extruding and Resilient Types)

   D 1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort [56,000 ft-lbf/ft3 (2,700 kN-m/m3)]

   D 1752 Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

3. Tennessee Department of Transportation (TDOT):

Standard Specifications for Road and Bridge Construction, latest edition.

1.04 SUBMITTALS

A. Description of Methods and Sequence of Placement. For each type of specially-finished concrete provide description of methods and sequence of placement.

1. Submit manufacturer's product data for the following:
2. Form release agent
3. Prefabricated control joint
4. Preformed joint filler
5. Sealants
6. Colored Admixture
7. Curing Compound

B. Submit samples of the following:

1. Prefabricated control joint
2. Preformed joint filler
3. Color chart for selection of sealant color.
4. Color sample and chart for selection of concrete color.
5. Pea gravel for seeded exposed aggregate concrete.

C. Construct Concrete Sample Panels:

1. Construct a minimum 15’ x 10’ panel of finished 4-inch washed exposed aggregate colored concrete pavement for approval, at least 15 days prior to final concrete paving work. Sample shall be constructed within the vicinity of the proposed finish work to facilitate comparisons during construction. Sample may be constructed in an area of proposed finish work at the contractor’s own risk. The sample shall demonstrate the typical installation of concrete, including saw cut score lines for grids, banding, color separation, expansion joint and sealant, curing and finishing material, surface texture, color, and edge treatment. The accepted sample, upon approval, shall be maintained as the standard of minimal quality for approval of all proposed washed exposed aggregate color concrete pavement work required for the project. Unacceptable sample panels shall immediately be removed from the site.

1.05 QUALITY ASSURANCE

A. Unless otherwise specified, work and materials for construction of the Portland cement concrete paving shall conform to ACI 316R, and applicable portions of the TDOT Standard Specification Section 501-Portland Cement Concrete Pavement, and Section 701-Cement Concrete Sidewalks, Driveways and Median Pavement.

B. Surfaces of concrete patios and walks shall be stable, firm and slip resistant. Construct patios so that water does not accumulate on concrete surfaces and has positive drainage away from all buildings and building foundations.

C. Paving work, base course installation, top course installation, and the like, shall be done only after excavation and construction work that might injure them have been completed. Damage caused during construction shall be repaired before acceptance.

D. Existing paved areas shall, if damaged or removed during course of this project, be repaired or replaced under this Division 2 Section, CONCRETE PAVING. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work installed under this Contract.

E. Pavement, base, or subbase shall not be placed on a muddy or frozen subgrade

F. Installation of seeded and washed exposed aggregate colored concrete shall be performed by a company that specializes in the installation of seeded and washed exposed aggregate colored concrete with sawn joints. The company shall demonstrate successful projects that are identical for surface treatment and jointing of seeded and washed exposed aggregate colored concrete utilizing aggregates of the specified size and color range. Submitted projects shall demonstrate concrete surface coloring and joint durability against freeze/thaw over a minimum of three years with at least 3 projects demonstrating durability over 5 years.

1.06 TESTING AND INSPECTION

A. The Owner reserves the right to retain an independent testing laboratory to perform inspection and testing of paving and associated work.

PART 2 - PRODUCTS

2.01 AGGREGATE BASE COURSE

A. Aggregate Base Course

1. Material for mineral aggregate base course shall be specified, provided, installed and paid for under the work of the Section 903.05 of the TDOT Standard Specifications.
2. Material for aggregate base course shall conform to the TDOT Standard Specifications Section 903.05, Class A aggregate, Grading A.

2.02 CONCRETE FORMWORK

A. The dimensions of the lumber used to form concrete pavements shall not be less than 2 inches nominal thickness by the required pavement depth of 4 inches.

2.03 STEEL REINFORCEMENT

A. Steel reinforcing bars shall conform to ASTM A 615.

1. Bars employed as reinforcement shall be deformed type.
2. Unless otherwise indicated on the Contract Documents, reinforcing bars shall be Grade 60.

B. Steel expansion dowels shall be hot-rolled plain steel rounds conforming to the requirements of AASHTO M31, Grade 60 and consisting of a 1/2 inches by 24 inches smooth steel dowel and compatible waxed tube sleeve, by 12 inches in length.

1. Dowels and sleeves shall be as furnished by A.H. Harris & Sons, Inc., by U.S. Steel Corp., by Edgecombe Steel Corp., or approved equal.
2. Dowels shall be epoxy coated.

2.04 PORTLAND CEMENT CONCRETE

A. Cast-in-place concrete shall be air-entrained concrete with minimum 28-day compressive strength of 4,000 pounds per square inch.

1. Air Entrainment: Concrete shall be air-entrained 7 percent minimum +/-1 percent, by volume.
2. Slump: Concrete shall have a slump of 2 inches to 4 inches slump.
3. Maximum Aggregate Size: Aggregate size shall be a maximum of 3/4 inches.
4. Thickness of Concrete: Depths shall be as noted on the Contract Documents.

2.05 SURFACE RETARDERS

A. Surface retarders shall be Surface Etch by ACP International, Pieri Top Coat by Grace Construction Products, Top-Etch Surface Retarder by Unitex Chemicals, or approved equal.

2.06 AGGREGATE FOR ACID-WASHED AGGREGATE CONCRETE

A. Stone aggregate for seeded exposed aggregate concrete pavement shall be as follows:

1. Stone shall be water-washed peastone matching the approved color samples, with rounded edges, free from organic materials, surface coatings, or other deleterious materials. It shall conform to the following gradations:

Sieve Size	Percent Passing (by Weight)
1/2 inch	100
3/8 inch	85-100
No. 4	20-50
No. 8	0-15

2. Stone for the Interior Slab shall be of colors in a range of dark grey to charcoal. Stone colors shall be approved by the Landscape Architect from submitted samples.
3. Stone for the Border Slab shall be of colors in a light grey range. Stone colors shall be approved by the Landscape Architect from submitted samples.

2.07 COLOR ADDITIVE

A. Color Admixture for Integrally Colored Concrete shall be CHROMIX Admixture for Color-Conditioned Concrete.

1. Admixture shall be a colored, water-reducing, admixture containing no calcium chloride with coloring agents that are lime-proof and ultra-violet resistant.
2. Colored admixture shall conform to the requirements of ACI 303.1, ASTM C979, ASTM C494 and ASSHTO M194.
3. Raw pigments are not an equivalent and may not be substituted.

B. Curing Compound for Integrally Colored Concrete: Curing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.

1. Exterior Integrally Colored Concrete: LITHOCHROME® Colorwax™; Sika Corporation.. Use to cure exterior flatwork that will be allowed to cure naturally with only occasional maintenance.

C. Curing and Sealing Compound: SCOFIELD® Cureseal-W™ [Semi-gloss] and SCOFIELD® Cureseal™ 700 [Matte]; Sika Corporation.. Curing and sealing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.

D. SUBSTITUTIONS: The use of products other than those specified will be considered providing that the Contractor requests its use in writing within 14-days prior to bid date. This request shall be accompanied by the following:

1. A certificate of compliance from material manufacturer stating that proposed products meet or exceed requirements of this Section.
2. Documented proof that proposed materials have a 10-year proven record of performance confirmed by at least 5 local projects that [Architect] [Landscape Architect] [Engineer] can examine.

2.08 INTEGRAL CONCRETE COLOR

A. Colors: As selected by Architect and Landscape Architect from L.M. Scofield color chart P-CHROMIX Admixture Color.

1. Interior Slab- Colored concrete shall match C-19 Gray Stone. Final color to be selected by landscape architect.
2. Border Slab- Colored concrete shall match C-24 Charcoal. Final color to be selected by landscape architect.

2.09 EXPANSION JOINTS

A. Unless otherwise indicated on the Contract Documents, expansion joints shall be located 20 feet on-center, maximum.

B. Expansion Joint Filler:

1. Closed cell polymer foam meeting requirements of ASTM D 1752, Sections 3.1 to 3.4, based on compression requirement of 10 pounds per square inch minimum and 25 pounds per square inch maximum. Recovery rate following 50 percent compression shall exceed 99 percent recovery, per ASTM D 545. Foam shall be equal to Ceramar Foam Filler, manufactured by W.R. Meadows. Inc., or an approved equal.
2. Expansion joint filler shall have a removable cap cover for the joint filler with integral permanent plastic bond breaker such as Snap-Cap from Seal Tight manufactured by W.R. Meadows, Inc., or approved equal. Cover width shall be sized to match width of joint filler.

2.10 SEALANT

A. Joint sealant and primer shall be polyurethane-based, one component, elastomeric sealants, complying with Fed. Spec. TT-S-00230C, Class A Type 1. Color shall be as selected by the Owner. Sealants shall be self-leveling pour grade type.

1. Vulkem 45, as manufactured by Mameko International, 4475 East 175th Street, Cleveland Ohio 44182, (800) 321-6412.
2. Urexpan NR-210, as manufactured by Pecora Corporation, 165 Wambold Road, Harleysville, PA 10348, (215) 723-6051
3. PSI 951, as manufactured by Polymeric Systems Inc., Phoenixville, PA, (800) 228-5548.

B. Provide only materials that are known to be fully compatible with the actual installation condition, as shown by the manufacturer's published data or certification. Use manufacturer's recommended joint primer.

2.11 BOND BREAKER

A. Bond breaker shall be asphalt felt conforming to ASTM D 226, Type I or 6-mil polyethylene sheeting.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE

A. Areas to be paved shall be compacted and brought to subgrade elevation and all said work specified, performed and paid under Division 2 Section, EARTH MOVING, before work of Section is performed. Final fine grading, filling, and compaction of areas to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be as specified and performed in accordance with TDOT Standard Specification Section 203.

B. Existing subgrade material that will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material specified under Division 2 Section, EARTH MOVING, of this Specification.

C. Subgrade of areas to be paved shall be recompacted as required to bring top 8 inches of material immediately below aggregate base course to a compaction at optimum moisture of at least 95 percent of maximum density, as determined by ASTM D 1557. Subgrade compaction shall extend for a distance of at least 12 inches beyond pavement edge.

D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade, subbase, base, or pavement, subsequent backfill and compaction shall be performed as directed by the Landscape Architect as specified in accordance with Division 2 Section, EARTH MOVING, of this Specification. Uniformly and properly grade all such completed subgrade areas after filling.

E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 inches deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing pavement as specified, performed and paid for under Division 2 Section, EARTH MOVING, of this Specification.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated under Division 2 Section, EARTH MOVING, of this Specification, of this Specification, and material unsuitable for or in excess of requirements for completing work shall be disposed of off-site.

H. The Landscape Architect will inspect the prepared subgrade. Contractor shall arrange to have the Landscape Architect visit the site to inspect and approve subgrade. Disturbance to subgrade caused by inspection procedures shall be repaired as specified under Division 2 Section, EARTH MOVING, of this Specification.

3.02 AGGREGATE BASE COURSE

A. Aggregate base course for concrete paving shall be provided, installed and paid for under the TDOT Standard Specification Section 903.

3.03 FORMWORK

A. All forms shall be joined neatly and tightly, shall be set true to line and grade, well staked and braced, and shall have uniform bearing throughout their length. Remove all forms and miscellaneous appurtenances from pavement edges and dispose of all formwork and appurtenances at the end of the construction project.

1. Forms shall not be moved for 72 hours after the concrete has been placed, or for a longer period if directed by the Landscape Architect.
2. Remove all forms. Extreme care shall be taken in removing forms in order that no damage will be done to the concrete.
3. Under no condition shall any bar, pick or other tool be used which depends upon leverage on the concrete for removal of the forms.

3.04 STEEL REINFORCEMENT

A. Before being placed in position, reinforcing for reinforced concrete shall be thoroughly cleaned of loose mill and rust scale, dirt, ice, and other foreign material which may reduce the bond between the concrete and reinforcing. Where there is delay in placing concrete after reinforcement is in place, bars shall be re-inspected and cleaned when necessary.

B. Reinforcing Steel: After forms have been coated with form release agent, but before concrete is placed, reinforcing steel anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted.

1. Any bar showing cracks after bending shall be discarded.
2. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Landscape Architect.

C. Unless otherwise indicated on the Contract Documents, reinforcing shall extend within 2 inches of formwork and expansion joints. Reinforcing shall continue through control joints.

D. The Owner may do core testing to make sure that reinforcement is in the proper position. If testing shows otherwise concrete will be rejected and the Contractor shall remove all rejected slabs and re-pour new slabs at no additional cost. Contractor shall repair cored holes as directed by the Landscape Architect.

3.05 EXPANSION JOINTS

A. Expansion joints shall be 1/2 inch wide and shall be as located on the Contract Documents. Expansion joint shall be formed in the concrete to required width with preformed joint filler in place. Joint filler shall extend the full depth of the slab. Joint filler shall extend the full length of the expansion joint. For concrete banding and concrete pavements and pads, depth of joint filler shall be as required to form a 3/4 -inch deep sealant recess below finished concrete surface.

B. Place expansion joints spaced on 20-foot centers. When provided, clarification documents that show specific locations of expansion joints shall direct the Contractor where to place expansion joints. Such clarification documents may place joints closer than 20-foot centers. In the absence of clarification documents the language of this Section shall govern.

1. Expansion joints shall be placed where pavement meets flush foundations and footings, concrete or bituminous concrete curbing or other vertical structures, including light bases, hydrants, walls, buildings, piers and walls, and at other conditions as shown on the Contract Documents.
2. Contractor shall request the presence of the Landscape Architect to review the layout of expansion joints prior to pouring the concrete.
3. Follow the manufacturer's application recommendations for joint filler and sealer.
4. Joint alignment shall be straight and true.

C. Where expansion dowels are use in the expansion joints, dowels and greased sleeves shall be set parallel with the top and bottom surfaces of the concrete slab.

3.06 PORTLAND CEMENT CONCRETE PAVING

A. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base and the like, shall meet the requirements of ACI 316R and TDOT Standard Specification Section 501, whichever is deemed more restrictive as determined by the Landscape Architect. Pavement shall be constructed in accordance with the Contract Documents.

B. The Landscape Architect shall be notified of concrete placement sufficiently in advance of start of operation to allow his representative to complete preliminary inspection of the work, including subgrade, forms, and reinforcing steel, if used. No concrete shall be deposited until the Landscape Architect has inspected the placing of reinforcement and given permission to place concrete.

C. Normal concrete placement procedures shall be followed. Concrete shall arrive at the job site so that no additional water will be required to produce the desired slump. When conditions develop that required addition of water to produce the desired slump, permission of the Landscape Architect must be obtained. The concrete shall be transported from the mixer to its place of deposit by a method that will prevent segregation or loss of material.

1. Concrete pavement shall be placed in a series of alternate pours such that every other panel bounded by expansion joints shall be poured first.
2. The intervening panels shall then be poured as a secondary operation only after the first panels have hardened sufficiently to allow the removal of all temporary transverse forming supports.
3. Concrete shall be placed in one course, to full depth, as detailed on the Contract Documents.

D. Work shall not be performed during rainy weather or when temperature is less than 40 degrees Fahrenheit. In the event that unforeseen rain occurs, cover all broom finished concrete surfaces with plastic sheet covering to prevent alteration of texture. Concrete slabs with textured concrete surfaces altered by rain shall be removed from the site as directed by the Owner’s Representative.

E. Adjacent work shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original conditions.

F. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall thoroughly damp when concrete is placed. There shall be no free water on surface.

G. Concrete that has set or partially set before placing shall not be employed. Re-tempering of concrete will not be permitted.

H. Concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.

I. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Laitance is the accumulation of fine particles on the surface of freshly poured concrete caused

by an upward movement of water through the concrete. This can be caused by too much mixing water, by excessive tamping, or by vibration of the concrete. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

3.07 FINISHING WASHED EXPOSED AGGREGATE CONCRETE PAVEMENT

A. Screed and strike off surface of concrete to design grade, floating all edges and closing any holes in the surface of the concrete.

B. To assist in bull floating, filling in the holes of the struck concrete and establishing a wet grout at the surface, spray a small amount of water over the surface of the concrete. The top layer of cement past will become sacrificial and will be removed. Do not overwork the surface and make no cold joints.

C. As the surface of the concrete starts of dry (20 to 30 minutes), spray apply a surface retarder over all surfaces of the concrete. Use a low-pressure spray can to apply the manufacturer's recommended rate of surface retarder.

D. Allow surface water to dry. Use plastic covers as required to prevent surface dehydration in warm weather conditions.

E. Once concrete has reached no less than 600 psi compressive strength, hose off the surface layer of cement paste that has been retarded by the surface retarder. Utilize pressure wash systems and brooms to move fine particles of cement and sand away from the cleaned surfaces. Avoid cement and sand stains to surrounding materials. Use caution during this operation to avoid removing stones from the concrete surfaces. If concrete appears grouty or should spray and brushing operations cause stones to loosen from the concrete surface, stop work and wait for the concrete to harden to the required psi. The goal of this operation is to wash away a uniform layer of cement paste to expose the aggregate finish.

3.08 CURING

A. It is essential that concrete be kept continuously damp from time of placement until end of specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.

B. Concrete surfaces shall be cured by completely covering with curing paper or application of a curing compound.

1. Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Do not moisten concrete surface between 24 and 36 hours after placing concrete. During curing period surface shall be checked frequently, and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.

2. If concrete is cured with a curing compound, compound shall be applied at a rate of 200 square feet per gallon, in two applications perpendicular to each other.

3. Curing period shall be seven days minimum.

C. Integrally Colored Concrete: Apply [curing] [curing and sealing] compound for integrally colored concrete according to manufacturer's instructions using manufacturer's recommended application techniques. Apply [curing] [curing and sealing] compound at consistent time for each pour to maintain close color consistency.

1. Curing compound shall be same color as the colored concrete and supplied by same manufacturer of the colored admixture.

2. Precautions shall be taken in hot weather to prevent plastic cracking resulting from excessively rapid drying at surface as described in CIP 5 *Plastic Shrinkage Cracking* published by the National Ready Mixed Concrete Association.

3. Do not cover concrete with plastic sheeting.

3.09 CONTROL JOINTS

A. Control joints indicated in washed and seeded exposed aggregate concrete shall be sawn by using a diamond blade concrete power saw. Joint shall be made after concrete has completely cured and reached the required strength. Saw joints shall be straight and true to the Contract Documents. Saw shall cut into slab at least 1 inch, but in no case less than 25 percent of slab depth.

3.10 COLD WEATHER CONCRETING

A. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40 degree Fahrenheit. or is excepted to fall to below 40 degree Fahrenheit within 72 hours, and the concrete after placing shall be protected by covering, heat, or both.

B. Details of handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Landscape Architect. Procedures shall be in accordance with provisions of ACI 306R.

3.11 HOT WEATHER CONCRETING

A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. Every effort shall be made to minimize delays which will result in excessive mixing of the concrete after arrival on the job.

B. During periods of excessively hot weather (95 degree Fahrenheit., or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 95 degree Fahrenheit., when ready for placement will not be acceptable, and will be rejected.

C. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, and the like.) and relative humidity. Records shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

3.12 SEALING OF JOINTS

A. Where indicated on the Contract Documents, expansion joints and control joints in concrete banding and expansion joints in concrete walkways shall be sealed with joint sealant as specified and paid for under the work of Division 7 Section, JOINT SEALERS, of this Specification.

3.13 PROTECTION OF CONCRETE SURFACES

A. Concrete surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary 1/2-inch, thick plywood sheets shall be used to protect the exposed surface.

B. The Contractor shall provide adequate surveillance for all poured-in-place concrete pavements until concrete has set firmly, to prevent unwarranted markings of the concrete surface. Any unauthorized marking or graffiti in the finished surfaces shall be a cause for rejection by the Landscape Architect and replacement by the Contractor.

3.14 ACCEPTANCE STANDARDS

A. The following acceptance standards shall be applied to this Contract. These standards are considered superior to typical industry standards. Any portion of the concrete paving that does not come up to these required acceptance standards shall be removed at the direction of the Landscape Architect. Saw cut pavement at nearest adjacent joint, remove concrete pavement

and discard off site in a legal manner and replace with new concrete pavement meeting the requirements of this Division 2 Section, REINFORCED CONCRETE PAVEMENT.

1. Pavement surfaces shall be free of all cracking.
2. Pavement surfaces shall not pond water.
3. Pavement surfaces shall be free of visible high and low spots.
4. Steel mesh reinforcing shall not penetrate the surfaces or sides of the concrete slab.
5. Control joints and all expansion joints shall be straight, true, uniform in width and free from twists, bends, kinks and misalignments.
6. Saw cut joints shall be free of chips and spauling at joint edges.
7. Edges shall be consistent, true, crisp and complete.
8. Pavement shall show no graffiti. Pavement shall show no rubbed surfaces indicative of attempts to erase graffiti.
9. Expansion joints and score joints shall be placed as required by the Contract Documents.
10. Concrete surfaces shall be free of all stains, including those created during the course of the construction by the Contractor, caused by natural events, or caused by vandalism.
11. All expansion joints shall be flush.
12. Stains from construction or from natural causes
13. Pours different in color as determined by the Landscape Architect.
14. Pours without expansion joints cast into them.
15. Pours not conforming to the Contract Documents.
16. All forms shall be removed from the site.

END OF SECTION

SECTION 32 16 00

CURBS AND SIDEWALKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation and placement of combination portland cement concrete curb and gutter.

B. Preparation and placement of portland cement concrete curb.

C. Preparation and placement of portland cement concrete sidewalk.

1.02 RELATED SECTIONS

A. Section 310000 – Earthwork

B. Section 321123 – Aggregate Material.

C. Cast-in-place Concrete (See Architectural/Building Specifications).

D. State Highway Department Standard Specifications.

E. Construction Drawings.

1.03 REFERENCE STANDARDS

A. American Concrete Institute (ACI) latest edition.

1. 304R Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
2. 308 Standard Practice for Curing Concrete.

B. American Society for Testing and Materials (ASTM) latest edition.

1. A615 Deformed and Plan Billet-Steel for Concrete Reinforcement.
2. C33 Concrete Aggregates.
3. C94 Ready-Mixed Concrete.
4. C150 Portland Cement
5. C260 Air-Entraining Admixtures for Concrete
6. C309 Liquid Membrane-Forming Compounds for Curing Concrete
7. C494 Chemical Admixtures for Concrete
8. D1751 Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

C. FS TT-C-800 – Curing Compound, Concrete, for New and Existing Surfaces.

1.04 QUALITY ASSURANCE

A. Establish and maintain required lines and elevations.

B. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner.

1.05 SUBMITTALS

A. Submit materials certificate to the independent testing laboratory which is signed by materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein.

1.06 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 PRODUCTS

2.01 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to from radius bends as required. Forms shall be of depth equal to depth of curbing or sidewalk, and so designed as to permit secure fastening together at tops. Coat forms with non-staining type of coating that will not discolor or deface surface of concrete.

B. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40.

C. Concrete Materials: Comply with requirements of Section 033000 for concrete materials, admixtures, bonding materials, curing materials, and others as required.

D. Joint Fillers: Resilient pre-molded bituminous impregnated fiberboard units complying with ASTM D 1751, FS HH-F-341, Type II, Class A.

E. Joint Sealers: Non-priming, pourable, self-leveling polyurethane. Acceptable sealants are Sonneborn “Sonolastic Paving Joint Sealant, Sonneborn “Sonomeric CT 1 Sealant”, Sonneborn “Sonomeric CT 2 Sealant, Mameco “Vulken 245”, or Woodmont Products “Chem-Caulk”.

2.01 MIX DESIGN AND TESTING

A. Concrete mix design and testing shall comply with requirements of Section 03300.

B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce following:

1. Compressive Strength: 4,000 psi, minimum at 28 days, unless otherwise indicated on Construction Drawings.
2. Slump Range: 2 to 5 inches at time of placement.
3. Air Entrainment: 5 to 8 percent.

PART 3 EXECUTION

3.01 PREPARATION

A. Proofroll prepared base material surface to check for unstable areas. Begin paving work only after unsuitable areas have been corrected and are ready to receive paving.

B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.02 INSTALLATION

A. Form Construction:

1. Set forms to required grades and lines, rigidly braced and secured.
2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place a minimum of 24 hours after concrete placement.
3. Check completed formwork for grade and alignment to following tolerances:
   a. Top of forms not more than 1/8-inch in 10’-0”.
   b. Vertical face of longitudinal axis, not more than ¼-inch in 10’-0”.
4. Clean forms after each use and coat with from release agent as often as required to ensure separation from concrete without damage.

B. Concrete Placement:

1. Place concrete in accordance with requirements of Section 033000.
2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until set at required finish elevation and alignment.
3. Place Concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowel, and joint devices.
4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible, if interrupted for more than ½ hour, place construction joint. Automatic machine may be used for curb and gutter placement. Machine placement shall be at required cross section, line, grade, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified herein.

C. Joint Construction:

1. Contraction Joints: Construct concrete curb or combination concrete curb and gutter, where specified on Construction Drawings, in uniform sections of length specified on Construction Drawings. Form joints between sections either by steel templates, 1/8-inch in thickness, of length equal to width of curb and gutter, and with depth which will penetrate at least 2-inches below surface of curb and gutter; or with ¾-inch thick performed expansion joint filler cut to exact cross section of curb and gutter; or by sawing to depth of at least 2-inches while concrete is between 4 and 24 hours old. If steel templates are used, they shall be left in place until concrete has set enough to hold its shape, but shall be removed while forms are still in place.
2. Longitudinal Construction Joints: Tie concrete curb or combination concrete curb and gutter, where specified on Construction Drawings, to concrete pavement with ½-inch round deformed reinforcement bars of length and spacing shown on Construction Drawings.
3. Transverse Expansion Joints: Concrete curb, combination concrete curb and gutter, or concrete sidewalk shall have filler cut to exact cross section of curb, gutter, or sidewalk. Joints shall be similar to type of expansion joint used in adjacent pavement

D. Joint Filler: Extend joint fillers full-width and depth of joint, and not less than ½-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.

E. Joints Sealants: Seal joints with approved exterior pavement joint sealants. Install in accordance with manufacturer's recommendations.

3.03 INSTALLATION PROCEDURES

A. The area to receive imprinted concrete shall have the sup-grade prepared as required as for any concrete slab on grade.

B. The formwork shall be installed in accordance with the drawings. The slab thickness shall be consistent with that of ordinary concrete slabs under the same conditions.

C. Provide reinforcement as specified.

D. Control joints and/or expansion joints shall be provided in accordance with the drawings and the guidelines established by the American Concrete Institute. As with any concrete slab, imprinted concrete usually contains construction joints, control joints and expansion joints. The contractor shall advise and work with the architect/engineer to determine the best location for these joints to minimize the visibility of the joints and to minimize unsightly cracking.

E. The concrete shall be placed and screeded to finished grade, and floated to a uniform surface using standard finishing techniques.

F. While the concrete is still in its plastic stage of set, the imprinting tools shall be applied to the surface.

G. Cure and Seal, or approved equal shall be applies in accordance with the manufacturer's recommendations immediately after the completing the imprinting process for.

H. After the initial curing period the surface of the slab shall be sealed.

3.04 BACKFILL

A. After concrete has set sufficiently, spaces on either side of concrete curb, combination concrete curb and gutter, or concrete sidewalk shall be refilled to required elevation with suitable material compacted in accordance with geotechnical report.

3.05 CLEANING AND ADJUSTING

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation and application of painted pavement markings.

B. Preparation and application of paint on curbs, guard posts, and light pole bases.

1.02 RELATED SECTIONS

A. Section 310000 – Earthwork.

B. Section 321100 – Paving Base Course.

C. Section 321600 – Curbs and Sidewalks.

D. Construction Drawings.

1.03 REFERENCE STANDARDS

A. FS TTP-85E

1.04 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

PART 2 PRODUCTS

2.01 MATERIALS

A. Paint shall be non-bleeding, quick-drying, alkyd petroleum base paint suitable for traffic-bearing surface and shall meet FS TTP-85E and be mixed in accordance with manufacturer's instructions before application.

B. Performed pavement markings shall be Stamark Intersection Grade Tape Series A420 as manufactured by 3M Traffic Control Materials Division, or approved equal.

PART 3 EXECUTION

3.01 PREPARATION

A. Sweep and Clean surface to eliminate loose material and dust.

B. Where existing pavement markings are indicated on Construction Drawings to be removed or would interfere with adhesion of new paint, a motorized abrasive devise shall be used to remove the markings. Equipment employed shall not damage existing paving or create surfaces hazardous to vehicle or pedestrian traffic. Within public rights-of way, method of marking removal shall be approved by appropriate governing authority.

3.02 APPLICATION

A. Apply two coats of paint at manufacturer's recommended rate, without addition of thinner, with maximum 100 square feet per gallon. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to ensure uniform, clean, and straight stripe.

B. Install pavement markings according to manufacturer's recommended procedures for the specified material.

C. Following items shall be painted with colors noted below:

1. Pedestrian Crosswalks: White
2. Exterior Sidewalk Curbs, Light Pole Bases, and Guard posts: as selected by Architect.
3. Fire Lanes: Red or per local code.
4. Lane Striping where separating traffic moving in opposite directions: Yellow
5. Lane Striping where separating traffic moving in the same direction: White
6. Handicap Symbols: Blue or per local code
7. Parking Stall Striping: White, unless otherwise noted on Construction Drawings
8. Associate Parking Area: White, unless otherwise noted on Construction Drawings

END OF SECTION

SECTION 32 91 00

PLANTING PREPARATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Carefully examine all of the Contract Documents for requirements that affect the Work of this Section.

1.02 SECTION INCLUDES

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to supply and place planting soils as indicated on the Contract Documents and as specified. Supplying and placement of planting soils shall include, but not be limited to:

1. Sampling and testing of planting soils.
2. Supplying, placing, spreading and grading of planting soils for lawns at fire lane.
3. Supplying, placing, spreading and grading of planting soils.
4. Providing all other sampling, testing, supplying, placing, spreading and grading of planting soils as required by this Section.

1.03 REFERENCES

A. The following standards shall apply to the work of this Section:

1. Tennessee Department of Transportation (TDOT) Standard Specifications for Road and Bridge Construction, latest addition.
2. American Society for Testing and Materials (ASTM):

D 75	Practice for Sampling Aggregates
D 422	Test Method for Particle-Size Analysis of Soils
D698-00a	Standard Test Methods for Laboratory Compaction (lb/ft3)
D1557	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb Rammer and 18-in. Drop

3. A.O.A.C.: Association of Official Agricultural Chemists

1.04 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Section 31 2000 EARTH MOVING
2. Section 32 9200 TURF AND GRASSES
3. Section 32 9300 PLANTS

1.05 SUBMITTALS

A. Submittals shall be made in accordance with ADMINISTRATIVE REQUIREMENTS.

B. Provide a written report to the Landscape Architect that the subgrade has been placed to the required elevations and that the subgrade drains water at the rates specified under the required percolation tests specified, performed and paid for under Division 31 EARTH MOVING. Perform no work of placing and spreading loam until elevations have been confirmed and written report has been accepted by the Landscape Architect.

C. At least 30 days prior to ordering materials, submit for approvals representative samples, certifications, manufacturer's product data and certified test results for materials specified below. No materials shall be ordered or delivered until the required submittals have been reviewed and approved. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Landscape Architect reserves the right to reject, on or after delivery, any material that does not meet these Specifications.

1. Planting soils for turf areas, lawn at fire lane, and plant beds: provide a one cubic foot representative sample per 1,000 cubic yard stockpile of proposed, blended planting soils and horticultural subsoil for testing. All stockpile sampling shall be per ASTM D75 and Appendixes for securing samples from stockpiles.
2. Planting soil delivered to the site shall be sampled and tested for conformance to these specifications. Take samples in locations as directed by the Landscape Architect.

D. From USDA NRCS County Soil Survey, submit name of off-site, proposed base topsoil, County of origin, Detailed Soil Map Unit, and Tables 13, 15, and 16 for the named soil.

E. Testing of proposed planting soils shall be at the Contractor's expense. Contractor shall deliver all samples to testing laboratories via overnight courier and shall have the testing report sent directly to the Landscape Architect. Perform all tests for gradation, organic content, soil chemistry and pH by A&L Analytical laboratories, Inc., 2790 Whitten Road, Memphis, TN, 38133 (901) 213-2400 or approved equal. Submit A&L Turf & Landscape Soil Sample Information Sheet with specific crop codes indicated. Testing reports shall include the following tests and recommendations. Testing reports shall include the following tests and recommendations.

1. Mechanical and chemical analysis shall be conducted in accordance with the current “standards” of the Association of Official Agriculture Chemists.
2. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
3. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. Sieve analysis shall be by combined hydrometer and wet sieving using the following sieves:
   a. #10 (> 2 mm)
   b. #18 (>1 mm)
   c. #35 (>0.5 mm)
   d. #60 (>0.25 mm)
   e. #140 (>0.10 mm)
   f. #270 (>0.05 mm)
   g. Silt (>0.002 mm)
   h. Clay (<0.002 mm)
4. Soil Fertility Testing: S3M (S1M: Soil pH, Buffer pH, Calcium, Magnesium, Potassium, Phosphorous and Percentage Organic Matter, calculated CEC, Base Sat.% + Boron, Copper, Iron, Manganese, Sodium, Sulfur, and Zinc).
5. Individual Analysis for Soluble Salts using a Conductivity Meter in a 1:2 soil/water (v/v), Nitrate Nitrogen, Ammoniacal Nitrogen, Exchangeable Aluminum.
6. Toxins including but not limited to lead, cadmium, arsenic and mercury.
7. Saturated hydraulic conductivity per ASTM D5856.
8. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish the work as specified.
   a. Test results: test data and recommendations for soil amendments including but not limited to: nitrogen, phosphorus, potassium and limestone.

9. Testing for Organic Amendment Materials
    a. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
    b. Test for agricultural suitability analysis as defined in Article 2.02 – Organic Amendment Materials (Compost).
    c. Stability assessed by the Solvita procedure, with protocols as specified by the Solvita manual (version 4.0). Stability tests shall be conducted by Woods End Research Laboratory, Mt. Vernon, Maine, Soil Control laboratory of California, or approved equal.

1.06 EXAMINATION OF CONDITIONS

A. The Contractor and any sub-Contractor responsible for the execution of the Work of this Section shall confirm by email to the Landscape Architect that the subsoil elevations have been brought to the proper subgrade elevations prior to proceeding with the spreading of the planting soils.

B. Carefully review the requirements of this Section to understand the requirements of percolation testing, compaction, slope and absence of debris of the subgrade prior to spreading of the planting soils.

C. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to sampling and testing of on-site stockpiles of delivered off-site planting soils prior to final planting installation.

1.07 DEFINITIONS

A. The following definitions shall apply to the work of this Section.

B. The following size distributions of mineral particles by diameter and sieve size shall apply to the following conventional names of soil types:

Conventional Name	Retained on U.S. Sieve No.	Diameter (mm)
Very coarse sand	#18	1 - 2
Coarse sand	#35	0.5 - 1
Medium sand	#60	0.25 - 0.5
Fine sand	#140	0.10 - 0.25
Very fine sand	#270	0.05 - 0.10
Silt	by hydrometer	0.002 - 0.05
Clay	by hydrometer	Less than 0.002

1.08 PROJECT/SITE CONDITIONS

A. Environmental Requirements: do not deliver or handle soils when overly dry, wet, or frozen. Soils that fail the Field Test below, are too wet for delivery or handling.
    1. Field Test
        a. Form soil in palm of hand, if soil retains shape and crumbles upon touching, the soil may be worked.
        b. If the soil will not retain shape it is too dry and should not be worked.
        c. If the soil retains shape and will not crumble, it is too wet and should not be worked.
        d. Lightly pat the soil in palm of hand, if free water becomes visible or soil glistens, it is too wet and shall be not be worked.

PART 2 - MATERIALS

2.01 PLANTING SOIL COMPONENTS

A. Planting soils for turf and planting shall be manufactured from 3 components: 1) base topsoil, 2) coarse and medium sands, and 3) compost.

2.02 ON-SITE TOPSOIL

A. This contract does not stipulate the presence of on-site, existing topsoil that meets this specification for gradation and fertility and in volumes sufficient to fulfill the requirements of this Contract or both. Contractor may use on-site topsoil for planting soil component only if it meets the requirements of this specification.

B. On-site, existing topsoil that has been contaminated by incorporation of subsoil shall not be acceptable for use and shall be replaced with imported topsoil meeting specification requirements at no cost to be owner.

C. On-site topsoil shall be free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris. Base topsoil shall also be free of quack-grass rhizomes, Agropyron Repens, and the nut-like tubers of nutgrass, Cyperus Esculentus, and all other primary noxious weeds. Base topsoil shall not be delivered or used for planting while in a frozen or muddy condition.

D. On-site topsoil shall be a named soil identified in a County Soil Survey, published by the United States Department of Agriculture, Natural Resources Conservation Service. Soil shall be the top horizon as identified in Table 15 – Engineering Index Properties of the Soil Survey. The soil shall be silt loam, loam, fine sandy loam or sandy loam classified under the USDA texture classification as described in Table 15 of the Soil Survey.

E. On-site topsoil as required for blending with other components shall be a naturally occurring soil formed from geologic soil forming processes without admixture of sand or organic matter sources (composts).

F. Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.

G. The organic content shall be between 4.0 and 8.0 percent.

H. The ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 8 or less. (D80/D30 < 8)

2.03 PLANTING SOIL FOR LAWN AT GRADE

A. Base Topsoil, Sand and Compost, each as specified above, shall be combined to create a uniform blend which meets the following requirements. The contractor shall have lawn planting soil tested and have test results submitted to the Landscape Architect for review and approval.

B. Loam borrow for planting turf, lawn, and grasses shall be one of the following sandy loams; “course sandy loam”, “sandy loam”, and “fine sandy loam”: determined by mechanical analysis (ASTM D 422) and based on the "USDA Classification System" and as defined in this Section. It shall be of uniform composition, without admixture of subsoil.

1. Loam borrow shall be free of stones greater than 0.75 inches, lumps, plants and their roots, debris, and other extraneous matter as determined by the Landscape Architect.

2. Loam borrow shall be free of plants and their roots, debris and other extraneous matter. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 milliohms/cm. (Test minus sieve #4 material.) Loam borrow shall not have levels of Exchangeable Aluminum greater than 200 parts per million except for acid-loving plants. Cation Exchange Capacity (CEC) shall be greater than or equal to 8.

C. Gradation for Material Passing the Number 10 Sieve:

1. Coarse and medium sands in proportion of 60 to 70 percent by weight.
2. Maximum particle size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.
3. Ratio of the particle size for 70% passing (D80) to the particle size for 20% passing (D30) shall be 4.5 or less. (D70/D20 <4.5)

D. Saturated hydraulic conductivity of the mix: not less than 2.5 inches per hour according to ASTM D5856-95 (2000) when compacted to a minimum of 88% Standard Proctor, ASTM 698.

E. Organic content: between 2.5 and 4.5 percent by weight.

F. The pH shall be between 6.0 and 7.0.

2.04 PLANTING SOIL FOR TREES, SHRUBS AND GROUNDCOVERS, and PERENNIALS

A. Base Topsoil, Sand and Compost, each as specified above, shall be combined to create a uniform blend which meets the following requirements. The contractor shall have planting soil tested and have test results submitted to the Landscape Architect for review and approval.

B. Loam borrow for planting trees, shrubs, groundcover and vines, and perennials shall be one of the following sandy loams; “course sandy loam”, “sandy loam”, and “fine sandy loam”: determined by mechanical analysis (ASTM D 422) and based on the "USDA Classification System" and as defined in this Section. It shall be of uniform composition, without admixture of subsoil.

1. Loam borrow shall be free of stones greater than 0.75 inches, lumps, plants and their roots, debris, and other extraneous matter as determined by the Landscape Architect.
2. Loam borrow shall be free of plants and their roots, debris and other extraneous matter. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 milliohms/cm. (Test minus sieve #4 material.) Loam borrow shall not have levels of Exchangeable Aluminum greater than 200 parts per million except for acid-loving plants. Cation Exchange Capacity (CEC) shall be greater than or equal to 8.

C. Gradation for Material Passing the Number 10 Sieve:

1. Coarse and medium sands in proportion of 55 to 65 percent by weight.
2. Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.
3. Ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 6.5 or less. (D80/D30 <6.5)

D. Saturated hydraulic conductivity of the mix: not less than 2 inches per hour according to ASTM D5856-95 (2000) when compacted to a minimum of 86% Standard Proctor, ASTM 698.

E. Organic content: between 4.0 and 6.0 percent by weight.

F. The pH shall be between 5.5 and 6.5.

2.05 SOIL ADDITIVES

A. General: Soil additives shall be used to counteract soil deficiencies as recommended by the soils analysis and as supplements for lawn construction as specified herein.

B. Acidulant for adjustment of planting soils pH shall be commercial grade flours of sulfur, ferrous sulfate, or aluminum sulfate that are unadulterated. Acidulants shall be delivered in unopened containers with the name of the manufacturer, material, analysis and net weight appearing on each container.

C. Ground limestone for adjustment of planting soils pH shall contain not less than 85 percent of total carbonates and shall be ground to such fineness that 40 percent will pass through 100 mesh sieve and 95 percent will pass through a 20 mesh sieve. Contractor shall be aware of

planting soils pH and the amount of lime needed to adjust pH to meet the requirements of the testing lab recommendations.

D. Commercial fertilizer shall be a product complying with the State and United States fertilizer laws. Deliver fertilizer to the site in the original unopened containers bearing the manufacturer's certificate of compliance covering analysis and which shall be furnished to the College's Representative. Fertilizer shall contain not less than the percentages of weight of ingredients as recommended by the soil analysis.

1. Fertilizer for planting shall be formulated for top-dressing, soil surface application to plants. Fertilizer shall be designed and certified by the manufacturer to provide controlled release of fertilizer continuously for not less than 9 months. One hundred percent of the nitrogen content shall be derived from organic materials. Nitrogen source shall be coated to ensure slow release. Fertilizer percentages of weight of ingredients shall be as recommended by the soil testing and analysis specified, performed, and paid for under this Section 32 91 00.

PART 3 - EXECUTION

3.01 TEST AND MODIFY EXISTING, AT GRADE, SUBSOILS AND PLACED FILLS TO DRAIN

A. Perform percolation tests on existing subsoils or placed fill prior to placing and spreading planting soils, including lawn planting soil and planting soil for plant beds. DO NOT MODIFY OR EXCAVATE SUBSOIL WITHIN DRIP LINE OF EXISTING TREES.

1. Perform percolation testing of existing subsoil to determine whether or not the subgrade will drain properly. Perform percolation tests as specified in this Section.

2. In the event that percolation testing indicates that the existing subsoil does not drain and the results of testing for saturated hydraulic conductivity indicate the soil is too fine to meet a minimum percolation rate of one inch per hour, then the contractor shall loosen up and remediate the existing subsoil as follows:

a. Spread to a depth of 4 inches a layer of coarse uniform sand as specified herein over the entire subsoil area deemed to compacted or too fine to meet percolation rates.

b. Loosen the subsoil with a ripper, excavator bucket or equivalent equipment to a depth of 12 inches from surface of subsoil.

c. Fine grade sand-modified soils to re-establish a uniform subgrade.

d. Re-compact sand-modified subsoil with two perpendicular passes of a wide tracked dozer CAT D-5 or smaller.

e. Additional compaction of the subgrade shall be prohibited unless as directed by the Landscape Architect. Wheeled vehicles or heavy equipment larger than a CAT D-5 are prohibited from driving over the sand-modified subgrade after acceptance by the Landscape Architect. Low ground pressure wheeled vehicles will be permitted after review and approval of equipment specifications by the Landscape Architect. LGP vehicles shall have ground pressure no greater than 4 pounds per square inch.

f. Immediately after establishing subgrade elevations, spread planting soil with dozer without additional compaction of the subgrade.

g. The work of placing sand and loosening the top 12 inches of soil and recompacting the soil shall be paid for under the Section EARTHWORK, of this Specification.

3. In the event that placed fills have been over compacted and will not drain, loosen up the top 12 inches of the subgrade to be by ripping or other mechanical means as noted above without amendment with sand. Recompact by bulldozer as noted above. The work of loosening the top 12 inches of soil and recompacting the soil shall be paid for under the Section EARTHWORK, of this Specification.

4. Remediation of existing subsoil or placed fills at locations for tree planting (coordinate this work with the work described in Section PLANTING, of this Specification):
    a. After tree pits have been excavated and prior to placement of trees in lawn areas, excavate shallow trenches a minimum of four feet long, minimum 18 inches wide and 18 inches deep with the tree pit.
    b. Fill trenches with a minimum of 18 inches of coarse uniform sand meeting the gradation requirements noted in this Section.
    c. Using the bucket of a backhoe, loosen soils to a minimum depth of three feet below subgrade (18 inches of sand plus eighteen inches of underlying soil) and incorporate the sand through the soil matrix in a coarse manner. Soils within the three foot mixing depth shall not be homogenized but shall be roughly mixed such that veins of sand run through the tree foot depth.
    d. After loosening and mixing, the soils shall be compressed with the bucket of the backhoe to a firm consistency, approximately 86 to 88 percent Standard Proctor maximum density.
    e. Trenches shall not be excavated nor sand placed, mixed or compacted when soils are in a wet conditions, nor during periods of rain.
    f. Prior to placing trees in tree pits, the top four inches of the entire tree pit area, including the loosened and compressed soils, shall be scarified with the teeth of the backhoe bucket or by raking. The Planting Soil shall be placed and compacted or compressed to approximately 84 to 86 percent Standard Proctor.
5. Perform sufficient percolation tests in areas of poorly draining or compacted subsoil or compacted placed fills as directed by the Landscape Architect to ensure that these underlying soils drain. Likewise, perform sufficient percolation tests after ripping and loosening to ensure that the soils are no longer too compact to drain.

3.02 FILLING AND COMPACTION

A. Subsoil or ordinary borrow shall have been excavated and filled as required by the Contract Documents and specified and paid for under Division 31 EARTHWORK, of this Specification, or as modified and remediated by sand and ripping as described in Division 31 EARTHWORK. Do not damage the work previously installed. Maintain all required angles of repose of materials adjacent to the loam as shown on the Contract Documents. Do not over excavate compacted subgrades of adjacent pavement or structures during loaming operations.

B. Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the Contract Documents. Provide a written report to the Landscape Architect that the subgrade has been placed to the required elevations and that the subgrade drains water at the rates specified under the required percolation tests specified, performed and paid for under this Division 31 EARTHWORK. Perform no work of placing and spreading loam until elevations have been confirmed and written report has been accepted by the Landscape Architect.

C. Clear the subgrade of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Such construction debris, trash, rubble and foreign material shall be removed from the site and disposed of in a legal manner. Fill any over excavation with approved fill and compact to the required subgrade compaction levels.

D. Do not proceed with the installation of planting soils until all utility work in the area has been installed.

E. Protect adjacent walls, walks and utilities from damage or staining by the planting soils. Use 0.5-inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.

3.03 PLACING PLANTING SOILS FOR LAWNS, TREE PITS AND PLANTING BEDS

A. Immediately prior to dumping and spreading planting soils in lawn areas, tree pits or planting beds, the subgrade shall be cleaned of all stones greater than 2 inches and all debris or rubbish. Such material shall be removed from the site, not raked to the edges and buried. Notify the Landscape Architect that the subsoil has been cleaned and request his/her attendance on site to review and approve subgrade conditions prior to spreading planting soils.

B. Planting soils delivered to the site shall be protected from erosion at all times. Materials shall be spread immediately. Otherwise, materials that set on site for more than 24 hours shall be covered with tarpaulin or other soil erosion system acceptable to the Landscape Architect and surrounded by silt fence.

C. No planting soils shall be handled, planted, or seeded in any way if it is in a wet or frozen condition. A moist planting soil is desirable.

D. Planting soils shall be sampled and tested as specified, performed and paid for under the work of this Section, to verify application and incorporation of limestone, fertilizer and other soil amendments.

E. The Contractor shall install planting soils in successive horizontal lifts no thicker than 6 inches to the desired compaction as required by the Contract Documents. The Contractor shall install the soil at a higher level to anticipate any reduction of planting soils volume due to compaction, settling, erosion, decomposition, and other similar processes during the warranty period. The Landscape Architect will ensure that the full depths of planting soils for lawn and plant beds are obtained by digging holes in the planting soils at the same frequency as for compaction testing. DEPTH OF PLANTING SOIL VARIES WITHIN DRIP LINE OF EXISTING TREES. SEE PLANTING DETAILS.

1. Compact planting soils to the required density as specified herein.
2. Maximum dry density for soils shall be determined in accordance with ASTM D698. The following percentages of minimum to maximum dry densities shall be achieved for fill materials or prepared subgrades.

   In lawn, tree pits and plant beds:

		Minimum	Maximum
a.	Fills within lawn and planting areas in top eighteen inches of finished grade	80%	83%

3. The surface area of each lift shall be scarified by raking prior to placing the next lift.
4. In addition to the compaction range cited above, compact each lift sufficiently to reduce settling but not enough to prevent the movement of water and feeder roots through the soil. The planting soils in each lift should feel firm to the foot in all areas and make only slight heel prints. At completion of the planting soil installation, the soil should offer a firm, even resistance when a soil sampling tube is inserted from lift to lift.

F. Soil additives shall be spread and thoroughly incorporated into the layer of planting soils by harrowing or other methods reviewed by the Landscape Architect. The following soil additives shall be incorporated:

1. Ground limestone or acidulant as required by soil analysis to achieve the required pH as described in this Section.
2. Fertilizer at the rate and of analysis recommended by the soil analysis.
3. For plant beds and tree pits, spread approved compost across limits of bed or pit to a depth of 4 inches.

G. After planting soils and required additives have been spread to depths required by the Contract Documents, carefully prepare the planting soils by scarifying, harrowing, or tilling the topsoil to integrate soil additives into the top 6 inches of the loam. Remove all large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Remove from unscreened soils all stones over 1 inch in diameter from the top 6 inches of the loam bed. Planting soils shall also be free of smaller stones in excessive quantities as determined by the Landscape Architect.

H. Sufficient grade stakes shall be set for checking the finished grades of landforms. Stakes must be set in the bottom and at the top of slopes. Deviation from indicated elevations that are greater than one-tenth of a foot shall not be permitted. Connect contours and spot elevations with an even slope. Finish grades shall be smooth and continuous with no abrupt changes at the top or bottom of slopes.

I. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional planting soils and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.

J. Select equipment and otherwise phase the installation of the planting soils to ensure that wheeled equipment does not travel over subsoil, placed fills or ordinary borrow or already installed soil. Movement of tracked equipment over said soils will be reviewed and considered for approval by the Landscape Architect. If it is determined by the Landscape Architect that wheeled equipment must travel over already installed soil, provide a written description of sequencing of work that ensures that compacted soil is loosened and re-compacted as the work progresses or place one-inch thick steel plate ballast (or equivalent ballast approved by the Landscape Architect) over the length and width of any travel way to cover planting soils to protect them from compaction.

K. Disturbed areas outside the limit of lawn work shall be graded smooth and spread with a minimum of 6 inches of planting soils to the finished grade.

3.04 PERCOLATION TESTING FOR PLANTING SOILS FOR LAWNS, LAWNS AT FIRE LANE, TREE PITS AND PLANTING BEDS

A. After the placement of each lift, perform percolation tests to determine if the soil has been over compacted. Perform the following percolation test procedure in presence of landscape architect and field engineer:

1. Dig a hole in the installed soil that is a minimum of 4 inches in diameter. Holes in 6-inch lift in turf areas shall be 4 inches deep. Holes in 12-inch lifts in plant beds shall be 8 inches deep. Do not penetrate through the lift being tested.
2. Fill the hole with water and let it drain completely. Immediately refill the hole with water and measure the rate of fall in the water level.
3. In the event that the water drains at a rate less than 6 inches per hour for lawns at fire lane, till the soil to a depth required to break the over compaction.
4. In the event that the water drains at a rate less than one inch per hour for all other planting soils, till the soil to a depth required to break the over compaction.
5. Perform a minimum of one soil percolation test per each 10,000 square feet area of turf area and each 2,500 square feet of tree and shrub planting area as directed by the Landscape Architect.

3.05 ACCEPTANCE

A. Confirm that the final grade of the planting soils is at the proper finish grade elevations. Adjust grade as required to meet the contours and spot elevations noted on the Plans. Request the presence of the Landscape Architect to inspect final grade. Do not proceed with the remaining work of this Contract until the Landscape Architect has given his/her written approval of the final grade.

END OF SECTION

SECTION 32 92 00

TURF AND GRASSES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Carefully examine all of the Contract Documents for requirements that affect the Work of this Section.

1.02 SUMMARY

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all lawn and seeding installation and fine grading work and related items as indicated on the Contract Documents and/or as specified in this Section and includes, but is not necessarily limited to, the following:

1. Preparation for sod
2. Sodding
3. Maintenance and protection

1.03 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Section 32 9100 PLANTING PREPARATION
2. Section 32 9300 PLANTS

1.04 REFERENCES

A. The following standards shall apply to work of this Section:

1. Rules for Tennessee Department of Agriculture Plant Industries Regulations for Turfgrass Certification

1.05 SUBMITTALS

A. Submittals shall be made in accordance with ADMINISTRATIVE REQUIREMENTS.

B. Submit proof of landscape contractor's experience to the Owner’s Representative in accordance with QUALITY ASSURANCE paragraph of this Section.

C. At least 30 days prior to intended use, the Contractor shall provide sod sample.

1.06 EXAMINATION OF CONDITIONS

A. All areas to be improved shall be inspected by the Contractor before starting work and any defects such as incorrect grading, or drainage problems shall be reported to the Owner’s Representative prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be improved, and he shall assume full responsibility for the work of this Section.

B. The Contractor shall be solely responsible for judging the full extent of work requirements involved.

1.07 QUALITY ASSURANCE

A. Qualification of Landscape Contractor: The work of this Division 32 Section, TURF AND GRASSES, shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years experience. Proof of this experience shall be submitted per SUBMITTALS paragraph of this Division 32 Section, TURF AND GRASSES.

B. The ratio of laborers to certified landscape professionals or certified horticulturist shall not exceed twelve to one. Certified Landscape Professional or Certified Horticulturist shall be on the project site throughout the day-to-day performance of the work described in this Section.

PART 2 – PRODUCTS

2.01 LOAM

A. Loam borrow shall be specified, provided, installed and paid for under the work of Division 32, Section, PLANTING PREPARATION, of this Specification.

2.02 SOIL ADDITIVES

A. Soil additives shall be specified, provided and paid under Division 32, Section, PLANTING PREPARATION, of this Specification except for additional applications of fertilizer that shall be specified, provided and paid for under this Division 32 Section, TURF AND GRASSES based upon recommendations from soil analysis and testing as specified, performed and paid for under Division 32 Section, PLANTING PREPARATION, of this Specification.

2.03 SOD

A. Sod shall be turf-type southern US drought tolerant fescue blend. Sod shall be Bullseye, Talladega, or Wolfpack II nursery grown sod supplied by Mid Tenn Turf as indicated in the Plant Schedule.

B. Sod shall be machine cut from an established sod farm specializing in the production and harvesting of top quality, grass turf products. Sod shall be machine cut at a uniform soil thickness of 3/4-inch +/- 1/4 inch, at the time of cutting. Measurement for thickness shall exclude top growth and thatch. Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be 5 percent. Broken pads and torn or uneven ends will not be acceptable. Sod shall be at least one year old from time of original seeding.

C. Sod shall be free of grass species other than those specified in this Division 32 Section, TURF AND GRASSES. Sod shall be free of weeds.

D. Sod shall be furnished and installed in rectangular sod strips measuring 12 inches or 16 inches in width and from 4 feet to 6 feet in length, stored in rolls with the grass top side inverted so that the topsoil is to the exterior.

E. Sod shall be harvested, delivered and installed within a period of 36 hours. Soil on sod pads shall be kept moist at all times.

F. Stakes: Stakes for pegging the sod shall be sound hardwood approximately one inch by 2 inches and of sufficient length to penetrate the mat, the seed bed and to a minimum depth of 2 inches of subsoil. Stakes shall be free from insects and fungi and capable of remaining in the ground at least 2 years.

G. Sod delivered to the construction site which does not conform to the requirements of this Division 32 Section, TURF AND GRASSES, will be rejected by the Owner’s Representative and shall be removed from the site by the Contractor at no additional cost to the Owner. The Owner’s Representative will reject sod found to contain unacceptable levels of unspecified grass species, or weed species, at any time up to and including Final Acceptance. Contractor shall remove such sod from the site at no additional cost to the Owner. Contractor shall replace unacceptable sod with new, approved sod at no additional cost to the Owner. The Owner’s Representative shall be the sole judge of what constitutes acceptable or unacceptable levels of unspecified grass species or weed species.

2.04 FERTILIZERS – FOR GENERAL USE AREAS

A. Fertilizer shall be a commercial product complying with the State and United States fertilizer laws. Deliver to the site in the original unopened containers that shall bear the manufacturer's certificate of compliance covering analysis. Fertilizer shall contain not less than the percentages of weight of ingredients as recommended by the soil analysis specified, performed and paid for under the Division 32 Section, PLANTING PREPARATION, of this Specification.

2.05 LIMESTONE

A. Ground limestone for adjustment of loam borrow pH shall contain not less than 85 percent of total carbonates and shall be ground to such fineness that 40 percent will pass through 100 mesh sieve and 95 percent will pass through a 20-mesh sieve. Contractor shall be aware of loam borrow pH and the amount of lime needed to adjust pH to specification in accordance with testing lab recommendations.

2.06 HERBICIDES, CHEMICALS AND INSECTICIDES

A. Provide chemicals and insecticides as needed for fungus or pest control. All chemicals and insecticides shall be approved by the Tennessee Department of Agriculture for the intended uses and application rates. Application of herbicides, chemicals and insecticides shall be done by personnel licensed to do so in the state of Tennessee and in accordance with the manufacturer’s instructions on the label.

B. Provide post emergent crab grass control throughout the maintenance period to ensure a germinated and mown lawn free of crab grass.

2.07 WATER

A. The Contractor shall be responsible to furnish his own supply of water to the site at no extra cost. If possible, the Owner shall furnish the Contractor upon request with an adequate source and supply of water at no charge. However, if the Owner's water supply is not available or not functioning, the Contractor shall be responsible to furnish adequate supplies at his own cost. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.

PART 3 - EXECUTION

3.01 FILLING AND COMPACTION

A. Filling and compaction of loam shall be specified, performed and paid for under the work of the Section 32 91 00, PLANTING PREPARATION, of this Specification.

3.02 FINE GRADING

A. Fine grading shall be specified, performed and paid for under the work of the Section 32 91 00, PLANTING PREPARATION, of this Specification.

3.03 SOIL PREPARATION

A. Preparation for seeding:

1. Apply 100% strength isopropylamine salt of glyphosate to all seeding areas 2 weeks before compost manufactured topsoil (CMT) and seed mix applications to deter weed germination.
2. Apply pre-emergent across entire site, during the fall planting window specified herein, 3 months prior to seeding if seeding is done in the fall season.

3.04 SODDING

A. The season for sodding shall be from October 1 through May 21. Do not lay sod when weather reports indicate approaching freezing temperatures. Do not lay sod on frozen ground. The actual lawn construction work shall be done, however, only during periods within this season that are normal for such work as determined by weather conditions and by accepted practice in this locality.

B. Immediately prior to sodding operations, the loam bed shall be lightly scratched with a fine toothed harrow or hand rake to provide a slightly roughened surface to accept the sodding application.

C. The soil on which the sod is laid shall be reasonably moist and shall be watered, if necessary. The sod shall be laid smoothly, edge to edge, and where continuous or solid sodding is called for on the plans sod shall be laid with the longest dimension parallel to the contours. Sodding shall start at the base of slopes and progress upwards in continuous parallel rows. Vertical joints between sods shall be staggered. Immediately after laying, press the sod firmly into contact with the soil bed by tamping, rolling, or by other approved methods so as to eliminate all air pockets. Provide true and even surfaces, insure knitting and protect all exposed sod edges, but without displacement of the sod or deformation of the sod surface.

D. In all swales, and on all slopes steeper than or equal to three to one (3:1) and elsewhere as specified or as directed by the Owner's Representative, sods shall be held in place by stakes. Stakes shall be untreated wood one inch by two inches by twelve inches long. Staking shall be done immediately after tamping. At least one stake shall be driven through each sod to be pegged and the stakes shall be not more than two feet apart. Stakes shall have their flat sides against the slope and be driven flush.

3.05 LAWN MAINTENANCE

A. Maintenance shall begin immediately after any area is seeded or sodded and shall continue for a 90-day active growing period for seeded areas or until Final Acceptance, whichever is longer; following the completion of all lawn construction work, and until final acceptance of the project. In the event that seeding operations are completed too late in the Fall for adequate germination and growth of grass, then maintenance shall continue into the following Spring for the minimum 60 Day period. In addition, install blankets or netting to prevent loam degradation and movement over the winter. Submit product literature and samples to the Owner's Representative for review. Blankets and netting shall be placed in a timely manner at no additional cost to the Owner.

B. Maintenance shall include reseeding or re-sodding, mowing, watering, weed¬ing, fertilizing a minimum of two times in addition to the fertilizer incorporated by harrowing into the spread loam, and resetting and straightening of protective barriers. Lawn work maintenance shall also include chemical treatments as required for fungus and/or pest control.

C. During the maintenance period, any decline in the condition of seeded areas shall require immediate action to identify potential problems and to undertake corrective measures.

D. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn.

E. Protection

1. Lawn areas shall be protected by a 3-foot high barrier constructed of 2 inch by 2 inch hardwood stakes or iron pipes set 18 inches in the ground at 10 foot intervals and connected by No. 10 wire. Flags of white cloth shall be secured to the wire at center points between stakes.

2. Barriers must be raised immediately after lawn construction and shall be maintained until Acceptance.

F. Performance Requirements for Seeded Areas: After the grass in seeded areas has germinated, reseed all areas and parts of areas that fail to show a uniform stand of grass. Reseed such areas and parts of areas repeatedly until all areas are covered with a satisfactory growth of grass with no less than 20 grass shoots per square inch. Reseeding together with necessary grading, fertilizing, and trimming shall be done at the Contractor's expense.

G. Performance Requirements for Sodded Areas: All sod shall have become established. Dead portions of sod shall be removed and replaced. All joints between sod pieces shall be filled with loam. All pieces of sod shall have knit to loam.

H. Mowing and Edging:

1. The Contractor shall keep lawn areas mowed until Acceptance of the contract by cutting to a height of 2 inches when growth reaches 3 inches or as directed by the Owner's Representative.
2. At each mowing, all edges of walks, drives, plant beds and other border conditions shall be edge trimmed by hand or machine to produce straight and uniform edge conditions.
3. Remove and discard from paved areas only clippings and debris generated by each mowing and edging operation legally off-site. Do not mow grass when wet.

I. Fertilizing Lawns: Apply starter fertilizer as required to support seed germination and to establish an acceptable stand of grass. Provide an application of nitrogen fertilizer to seeded areas approximately two months after germination. This application shall correspond to the following application rates dependent upon the month of application.

1. September 1-15: Apply 1.0 pound of nitrogen per 1,000 square feet.
2. November 1 - 15: Apply 1.0 pound of nitrogen per 1,000 square feet.
3. March 15 - 31: Apply 1.0 pound of nitrogen per 1,000 square feet.

3.06 APPLYING LIMESTONE

A. The Contractor shall return to the site at the beginning of the next seeding and sodding season and spread limestone across all lawn areas installed under this Contract. The work of liming the fields shall be as specified under Division Section 32, PLANTING PREPARATION, of this Specification, and performed and paid for under this Division 32 Section, TURF AND GRASSES. Limestone shall be spread at rates determined by the soil tests specified, performed and paid for under Division 32 Section 32, PLANTING PREPARATION.

3.07 ACCEPTANCE

A. Following the minimum required maintenance periods for lawn construction, the Contractor shall request the Owner's Representative in writing for a formal inspection of the completed work. Request for inspection shall be received by the Owner's Representative at least 10 Days before anticipated date of inspection.

B. Acceptance Requirements:

1. At the end of the maintenance period, seeded areas shall have a close stand of grass as defined above with no weeds present and no bare spots greater than 3 inches in diameter over greater than 5 percent of the overall seeded area. At least 90 percent of the grass established shall be permanent grass species. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded areas shall be extended until deficiencies are corrected. Seeded areas to be corrected shall be prepared and reseeded in accordance with the requirements of this Division 32 Section, TURF AND GRASSES.
2. At least 90 percent of the stand of species established shall be permanent grass and forb species. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded areas shall be extended until deficiencies are corrected. Seeded areas to be corrected shall be prepared and reseeded in accordance with the requirements of this Section.
3. Sodded areas shall be in vigorous growing condition with no discolored, dead or otherwise unacceptable areas. Sod will have knit firmly to the loam subgrade and no weeds shall be present.
4. At the time of acceptance, the Contractor shall remove temporary barriers used to protect lawn areas.

C. Owner's Representative's inspection shall determine whether maintenance shall continue in any part.

3.08 CLEAN UP

A. Absolutely no debris may be left on the site. Excavated material shall be removed as directed. Repair any damage to site or structures to restore them to their original condition, as directed by the Owner's Representative, at no cost to the Owner.

END OF SECTION

SECTION 32 93 00

PLANTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Carefully examine all of the Contract Documents for requirements that affect the Work of this Section.

1.02 SUMMARY

A. The work of this Section includes all labor, equipment, and materials, necessary to perform the following:

1. Planting trees and shrubs.
2. Providing and placing backfill mix.
3. Anchoring trees.
4. Steel edging.
5. Planting maintenance.
6. One-year guarantee period for all plants.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Section 32 9100 PLANTING PREPARATION
2. Section 32 9200 TURF AND GRASSES

1.04 REFERENCES

A. The following standards shall apply to the work of this Section.

1. American National Standards for Tree Care Operations, ANSI A300. American National Standards Institute, 11 West 42nd Street, New York, N.Y. 10036.
2. American Standard for Nursery Stock, ANSI Z60.1. American Nursery and Landscape Association, 1250 Eye Street. NW, Suite 500, Washington, D.C. 20005.
3. Hortus Third, The Staff of the L.H. Bailey Hortorium. 1976. MacMillan.

1.05 SUBMITTALS

A. Submittals shall be in accordance with ADMINISTRATIVE REQUIREMENTS.

B. At least 30 days prior to ordering materials, the Contractor shall submit to the Landscape Architect the following. The Landscape Architect reserves the right to reject, on or after delivery, any material that does not meet these Specifications.

C. Material Sampling and Testing:

1. Planting Mulch: Submit a one cubic foot sample.
   a. Shredded hardwood mulch
2. Organic Matter: Submit a one cubic foot sample and manufacturer's certification of contents.

3. Inoculants:
   a. Submit manufacturer's product data certifying that inoculant being supplied conforms to these Specifications.
   b. Submit proof of purchase.
4. Tree Staking System: Submit manufacturer's product data of system.
5. Soil Additives: Submit manufacturer’s product data for all soil additives needed to amend a specific soil.

D. Submit proof of landscape contractor's experience to the Landscape Architect.

1.06 EXAMINATION OF CONDITIONS

A. All areas to be planted shall be inspected by the Contractor before starting work and any defects such as incorrect grading or inadequate drainage shall be reported to the Landscape Architect to beginning this work.

1.07 QUALITY ASSURANCE

A. Qualification of Landscape Contractor: The work of this Section shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years experience. Submit proof of this experience for approval.

B. Qualification of Arborist: All work of pruning (limbs and roots) shall be performed by an arborist certified by the International Society of Arboriculture. Refer to Tree Protection and Preservation Plan within the Contract Documents.

PART 2 - PRODUCTS

2.01 LOAM BORROW

A. Loam borrow for planting shall be specified, provided, installed and paid for under the work of the Section 32 9100 PLANTING PREPARATION, of this Specification.

2.02 SOIL ADDITIVES

A. Soil additives shall be specified, provided, installed and paid for under Section 32 91 00 PLANTING PREPARATION, of this Specification.

2.03 GRADES AND STANDARDS OF PLANTS

A. The Contractor shall furnish all plants shown on the PLANT SCHEDULE. No substitutions will be permitted, without written approval by the Landscape Architect.

B. Unless approved by the Landscape Architect, plants shall have been grown at latitude not more than 200 miles north or south of the latitude of the project unless the provenance of the plant can be documented to be compatible with the latitude and cold hardiness zone of the planting location.

C. Plants shall be in accordance with American Standard for Nursery Stock, ANSI Z60.1. Botanical plant names shall be in accordance with plant designations included in Hortus Third.

D. All deciduous trees shall meet the following standards:
   1. Trees shall have a single, straight trunk, well formed, and sturdy. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety.
   2. Trees with multiple leaders shall conform to all standards noted in this Section for single leader trees.
   3. The bark of all trees shall be vigorous and healthy.
   4. Pruning scars shall be clean cut and shall leave no protrusion beyond the branch collar.
   5. All trees shall have healthy, vigorous leaves or needles of normal size, color, shape, and texture.
   6. Deciduous trees shall have fall color typical for their species and variety.
   7. The height and spread of deciduous shade trees shown on the PLANT LIST shall be minimum requirements.
   8. No deciduous tree shall be pruned after selection in the nursery.

E. All Evergreen trees shall meet the following standards:

1. Measure the height of the evergreen trees from the trunk flair to the midpoint of the terminal leader.
2. No trees with double-leaders or twin-heads will be permitted.
3. Evergreen trees shall be well-branched to the ground.
4. No evergreen tree shall be pruned after selection in the nursery.
5. All trees shall have healthy, vigorous leaves or needles of normal size, color, shape, and texture.

F. All shrubs shall meet the following standards:

1. All shrubs shall be healthy and vigorous plants which are very well shaped, heavily branched, densely foliated, and true to form for the variety.
2. Canes or trunk(s) and branches shall be well formed and sturdy, branching uniformly from the ground.
3. No shrub with pest or mechanical damage will be accepted.
4. Shrubs shall show no signs of frost or winter damage to the foliage. Foliage shall not be in a state of drought stress. Leaves or needles shall show no signs of wilt or desiccation due to weather stress at any season of the year.

G. All ground cover plants and vines shall meet the following standards:

1. Ground cover plants and vines shall be of size, pot size, age, and condition listed in the PLANT LIST. When indicated on the PLANT LIST, the number of runners and the lengths of the runners of vines shall be minimums.
2. Plants shall be healthy, free of insects, and diseases.

2.04 ROOT SYSTEMS FOR ALL PLANTS

A. Trees designated balled & burlapped (B&B) shall be dug by hand or tree spade with firm, natural balls of soil retaining as many fibrous roots as possible, in sizes and shapes as specified in the American Standard for Nursery Stock, except as noted on PLANT SCHEDULE.

B. Root balls shall be firmly wrapped with natural, non-synthetic burlap and secured with heavy, natural, non-synthetic twine. Wire baskets installed as part of the tree spade operations are acceptable provided the wire baskets are partially removed at the time of planting, in accordance with the requirements of this Section.

C. Trees with loose or broken rootballs will not be accepted, except with special written approval by the Landscape Architect before planting.

D. Trees ands shrubs transported to the site with B&B root balls shall have root flares exposed prior to planting. Remove all excess topsoil from the top of the root ball to insure the root flare of the plants is exposed.

E. The base of the tree trunks shall be wrapped with a protective burlap layer, surrounded by a cardboard trunk protector, and loosely tied with twine.

F. Container Plants

1. Refer to American Standard for Nursery Stock for sizes of containers for container grown plants. Plants shall be free of circling roots on the exterior and interior of the root ball.

Roots shall not have grown out of the container, either over the lip or through drainage holes.

2. Container plants shall have been grown in the container long enough to have established roots throughout the growing medium.

2.05 INOCULANTS

A. Inoculants shall be manufactured by Horticultural Alliance, 1550 66th Avenue Drive East, Sarasota, FL 34243, (800) 628-6373; or approved equal.

2.06 MATERIALS FOR PLANTING SOIL AMENDMENT

A. Pine Bark: Horticultural-grade milled pine bark, with 80 percent of the material by volume sized between 0.1 and 15.0 mm.

1. Pine bark shall be aged sufficiently to break down all woody material. Pine bark shall be screened.
2. pH shall range between 4 and 7.0.
3. Submit manufacturer literature for approval.

B. Organic Matter: Leaf matter and yard waste composted sufficiently to break down all woody fibers, seeds, and leaf structures, and free of toxic and nonorganic matter. Organic matter shall be commercially prepared compost. Submit one pound sample and suppliers literature for approval.

C. Course Sand: Course concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.75 or greater.

1. Sands shall be clean, sharp, natural sands free of limestone, shale and slate particles.
2. Provide the following particle size distribution:

Sieve	Percentage Passing
3/8 in (9.5 mm)	100
No. 4 (4.75 mm)	95-100
No. 8 (2.36 mm)	80-100
No. 16 (1.18 mm)	50-85
No. 30 (0.60 mm)	25-60
No. 50 (0.30 mm)	10-30
No. 100 (0.15 mm)	02-10

D. Lime: shall be ground, palletized, or pulverized lime manufactured to meet agricultural standards and contain a maximum of 60 percent oxide (i.e. calcium oxide plus magnesium oxide). Submit manufacturer literature for approval.

E. Sulfur: shall be flowers of sulfur, pelletized or granular sulfur, or iron sulfate. Submit manufacturer literature for approval.

F. Fertilizer: Agricultural fertilizer of a formula indicated by the soil test. Fertilizers shall be organic, slow-release compositions whenever applicable. Submit manufacturer literature for approval.

2.07 PLANTING SOIL MIX

A. Planting soil shall be a mixture of silt loam or clay loam topsoil from off-site sources, course sand, and pine bark, mixed to the following proportion:

Component	% by volume
Pine bark	10% - 12%
Planting Soil (32 91 00)	88% - 90%

B. Planting soil mix shall be manufactured with pH levels to meet the specific needs of the plants:

1. For broad-leaved evergreens and plants of the Heath Family, Ericaceae, requiring an acid soil, planting soil mix shall have a true pH of 4.5 to 5.5.
2. Planting soil mix for general planting of non-acid loving plants shall have a true pH value of 6.0 to 6.5.
3. The amount of either sulfur or limestone required to adjust the planting soil mix to the proper pH range shall be approved by the Landscape Architect on the basis of soil tests as specified and paid for under this Section.
4. Planting soil mix for use in groundcover, perennial, and bulb planting shall consist of pH adjusted loam which has been thoroughly premixed with organic material in the proportions of one part organic matter, with 4 parts of approved loam.

C. Planting soil mix shall be thoroughly mixed, screened, and shredded.

D. Protect the planting soil mix from erosion prior to installation.

2.08 ANCHORING AND STAKING TREES

A. Tree staking: Tall vertical tree stakes and horizontally placed strapping to stabilize tree stems from wind and settlement.

1. Tree stakes shall be 2” square 6’ long wood posts.
2. Guys shall be soft polypropylene, woven strapping, rounded edges all sides to prevent bark damage. 900-pound test strength. Olive green color.

2.09 MULCH

A. Mulch: Mulch shall be high quality, premium shredded bark mulch free of dirt, debris and foreign matter. Pine straw shall not be used without Owner’s approval.

B. River Stone: Stone Mulch shall be water washed Mexican Beach Pebbles, black to grey in color, with rounded edges, free from organic materials, surface coatings, or other deleterious materials. Stone shall be between 3”-6” in size. River stone shall be chinked with pea gravel of matching color.

2.10 WRAPPING MATERIAL

A. Wrapping material shall be first quality, 4-inch wide heavy waterproof crepe paper manufactured for this purpose. Tape for securing wrapping material shall be a durable, weatherproof tape of same color as wrapping material.

2.11 WATER

A. The Contractor shall be responsible to furnish his own supply of water to the site at no extra cost. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.

2.12 STEEL EDGING FOR PLANT BEDS

A. Edging shall be 12 gauge 6 inch wide steel commercial edging with standard black powder coat finish. Edging shall be furnished in 10-16 foot lengths. Edging shall be manufactured by Collier Metal Specialties, or approved equal. Stake per manufacturer recommendations**.**

2.13 ANTIDESICCANTS

A. Antidesiccants shall be emulsions or other materials which will provide a protective film over plant surfaces permeable enough to permit transpiration and specifically manufactured for that purpose.

PART 3 - EXECUTION

3.01 PLANTING

A. Furnishing and planting of plant material shall include the digging of planting pits and plant beds, amendment of loam as required to produce planting soil mix, pH adjustment, furnishing the plants, and the labor of planting, fertilizing, and maintenance.

B. Prior to spreading of loam, subgrades shall have been tested to determine if they are too compact to drain water as specified, performed and paid for under the work of Section 32 9100 PLANTING PREPARATION, of this Specification.

C. Seasons for Planting:

1. Plant trees and shrubs when temperatures are between 35 and 60 degrees Fahrenheit and there are sufficient degree days (35 to 60 degrees F) before freeze or high temperatures threaten plant establishment. Plant only during days with temperatures suitable for planting. Do not plant when ground is frozen.
2. Contractor assumes all responsibility for the timing of the planting operations and for planting during inclement weather.

D. Plant Material Inspection:

1. At least one month prior to the expected planting date, the Contractor shall send the Landscape Architect to select and tag stock to be planted. The Contractor shall pay for the transportation, subsistence and overnight accommodations for the Landscape Architect to select plants.
2. In the event that plants at the nursery are not available or of insufficient size, the Contractor shall reimburse the Owner for all costs of the Landscape Architect's hourly services to select plants at other nurseries.
3. All plants shall be tagged for approval with the Landscape Architect's seals, and no plants will be accepted for delivery to the site without such seals.
4. Plants to be inspected shall be in locations and conditions that allow direct and un-obscured inspection by the Landscape Architect.
5. Inspection and approval of plants at the nursery shall not limit the right of subsequent inspection and rejection upon delivery to the site, or during the progress of the work if the Landscape Architect finds that plants do not meet the requirements of the PLANT SCHEDULE or this Contract, have declined noticeably due to handling abuse, lack of maintenance, or other causes. Cost of replacements, as required, shall be borne by the Contractor

E. Trucking, transport and stockpiling of plant material at the construction site:

1. Tie up branches of trees with rope or twine specifically manufactured to avoid abrasion of bark and branches. Do not damage bark or branches by tying operations.
2. Cover all plants during transport. Plant material arriving at the construction site in open trucks or trailers without cover will be rejected immediately upon delivery. Plant material arriving on site in anyway damaged, with dry rootballs, branches broken or bark skinned or torn will be rejected and replaced at no additional cost to the Owner.
3. Upon delivery, all plants shall be protected against drying out by excessive exposure to sunlight or wind. Plant material that cannot be planted within 24 hours of delivery to the construction site shall be healed in by covering with soil or wood chip mulch and watered daily until the time of planting. Plant material stockpile areas shall be protected against theft and damage by construction equipment. Plant material that is not planted within 14 days of arrive at the construction site will be rejected and replaced with new plants at no additional cost to the Owner. Plants shall be lifted and handled with suitable support of the soil ball to avoid damaging it.

F. Planting:

1. Notify the Landscape Architect within ten working days prior to the proposed arrival of plant material on the site.
2. Plant pits dug by machine shall have the sides of the holes scraped with hand shovels to prevent glazing or compaction of the sides of the hole. Remove and discard soils dug from plant pits.
3. Plant pits shall be dug to the dimensions shown on the Contract Documents.
    a. Plant beds for shrub massing shall be one large and continuous excavated bed. Extend bed no less than 3 feet beyond limits of shrub root balls on perimeter of bed.
    b. Plant pits for trees and shrubs not planted in mass shall be dug to the depth of the rootball to be planted.
    c. On-going cultural practice in nurseries will cause soil to be piled on top of root balls, burying the root flare. Remove all soil from around the root flare of the plant and from the top of the rootball to determine the true depth of the rootball. All plants that have been planted and have root flares that are buried will be rejected. All plants that have root flares set below finish grade will be rejected.
4. Prior to placing plants, spread a 4 inch thick layer of planting soil on the bottom of all planting beds, shrub pits and tree pits and rototill the planting soil into the subsoil.
5. All plant roots and earth balls must be damp and thoroughly protected from sun and wind from the beginning of the digging operation, during transportation, and at the site until the final planting.
6. Trees and shrubs shall be placed plumb, with root flares exposed.
7. Prior to completion of planting installations, remove rope and burlap from the trunk or stem of the plant. Leave rope and burlap intact on the top of the root ball.
8. Cut all wire baskets from the top of the root ball, leaving the wire basket intact on the sides of the root ball.

G. Installation of Planting Soil Mix

1. Review Section 32 19 00 PLANTING PREPARATION, to see full scope of planting soil work in this Contract.
2. Prior to backfilling plant beds or tree pits with planting soil mix, install subsurface drains, irrigation main lines, irrigation laterals and risers as shown on the Plans. Do not proceed with the installation of planting soil mix and amended topsoil until all utility work has been completed in the area and underneath the planting beds.
3. Backfill plant beds with planting soil mix in 6 to 8 inch lifts. Install soil higher than shown on the drawings, anticipating some amount of settlement of planting soil. Compact each lift sufficiently to reduce settling but not so much as to prevent movement of water and root growth. The soil in each lift should feel firm to the foot in all areas and make only slight heel prints.
4. A saucer shall be formed around each stand-alone tree and shrub at a depth of 3 inches.
5. Phase the installation of the planting soil such that wheeled and tracked equipment does not have to travel over already-installed topsoil or planting soil mix.
6. Maintain moisture conditions within the soil during installation to properly compact the soil. Stop planting operations with the start of steady rain or if the soils become wet. Indications of frozen soils, either subsoil, planting soil or topsoil, shall end the planting season.

7. Fertilizer shall be spread over the plant saucer or plant bed between the saucer and the edge of the rootball. Till the fertilizer into the soil to a depth of 4 inches prior to the placement of the planting mulch. Fertilizer shall be provided, spread and paid for under the Section 32 9100 PLANTING PREPARATION, of this Specification.
8. All plants shall be inoculated with mycorrhizal fungi. Inoculant shall be added after the plants have been placed in their holes. Open the required number of packets for each plant and thoroughly mix the inoculant powder into the upper 10 inches (250 mm) of backfill soil.
    a. Mycorrhizal fungal inoculant shall be added to the plant pits according to plant size.
    b. The application rates for mycorrhizal fungal packets shall be in accordance with the manufacturer's recommendations.
9. Immediately following the placement of the final lift of planting soil mix in shrub beds and individual tree pits and shrub pits, spread 4 inches of organic matter across the limits of the planting area and rototill into the planting soil to a depth of 4 inches into the soil.
10. Allow the finished grades after tilling to remain higher than surrounding grades and as shown on the grading plans in anticipation of settlement over time.

H. All plants shall be watered immediately following planting as necessary to thoroughly moisten rootball and plant pit loam and thereafter shall be inspected frequently for watering needs and watered, as required, to provide adequate moisture in the planting pit. The Contractor shall inspect tree pits 24 hours after initial watering to confirm that they are draining properly. If surface water or excessively saturated plant pit soils exist, the Contractor shall immediately notify the Landscape Architect. The Landscape Architect will recommend remedial measures based upon site conditions.

I. Keeping Trees Plumb – Staking and guying trees:
1. All trees shall be firmly staked and guyed with approved stakes and polypropylene strapping at the time of planting. Stakes shall be driven through the planting soil mix into the firm subsoil. Set stakes plumb and to the same elevation around t he tree. Tie off the strapping as shown on the detailed drawings.
2. Avoid damage to previously installed irrigation lines, subsurface drainage lines or other utilities installed as part of the work of this Contract.
3. Rake out planting soil around and above rootball to ensure a smooth surface with intact saucer.

J. Plant Bed Edging
1. Install edging at all plant bed locations, adjacent to gravel path and in locations shown on the Drawings. Fully bed the steel edging as shown on the Detailed Drawings, with 1”-2” min remaining above finish grade. Place edging prior to completely backfilling plant beds with specified planting soil. Set edging to the required alignment as shown in the drawings, curved and true and to the required elevation to ensure full mulch restraint.
2. Steel edging shall be securely staked in required position. Stakes shall be driven per manufacturer recommendations. Installed edging shall be free of chipped paint, dinged or rough edges.
3. Adjacent lengths shall be attached using manufacturer's standard connections according to manufacturer's published instructions.
4. Edging shall be set plumb and vertical at required line and at grade as indicated in the Contract Documents. Straight sections shall not be wavy; curved sections shall be smooth and shall have no kinks or sharp bends.
5. Set steel edge so that finished side without the stakes faces lawn or gravel path.

K. Mulch material shall be placed over entire saucer areas of individual trees and shrubs and over the entire area of planting beds to a depth of 3 inches after settlement, not later than one week after planting. Do not apply mulch prior to the first watering of plant materials. Do not apply mulch prior to placement of surface applied fertilizer and verification of placement by the Landscape Architect.

L. The trunks of all deciduous trees over 1-1/2 inches in diameter shall be wrapped by the Contractor immediately after the inspection of the trees by the Landscape Architect. Wrapping shall extend from the ground line to the height of the second branches or to the height directed. The specified wrapping shall be wound spirally, starting from the base and overlapping 1-1/2 inches in order to shed water. Wrapping shall be securely taped to prevent loosening and unraveling. If trees are planted in springtime, do not apply any tree wrapping. If deciduous trees are planted in the autumn, wrap the trees and then remove wrapping the following spring.

1. Trees delivered to the site wrapped for protection shall be unwrapped at the site for inspection of the trunk by the Contractor and Landscape Architect.

M. Pruning:

1. As directed by the Landscape Architect, each plant shall be pruned in accordance with the workmanship requirements of "Pruning Standards" for Class I, fine pruning, to preserve the natural character of the plant.
2. Tree pruning, as required, shall be undertaken to the full height of affected trees.
3. All dead wood or suckers and all broken or badly bruised branches shall be removed. Never cut a leader.

N. Protect existing lawns from damage. Any damage resulting from planting operations shall be repaired immediately at no cost to the Owner.

O. In the event that rock or underground construction work or obstructions are encountered in any plant pit or bed excavation work, alternate locations will be selected by the Landscape Architect. Relocation of plant pits or beds shall be provided at no additional cost to the Owner. Provide the Landscape Architect with no less than 48 hours notice of obstruction so that a site visit can be scheduled to establish new locations for plants.

P. Absolutely no debris may be left on the site. Repair any damage to site as directed by the Landscape Architect, at no additional cost.

3.02 MAINTENANCE

A. Maintenance shall begin immediately after each plant is planted and shall continue for a minimum 30-day Monitoring Period and for 12 months following Final Acceptance.

B. Maintenance shall consist of keeping the plants in a healthy growing condition and shall include but is not limited to watering, weeding, cultivating, pruning, re-mulching, tightening and repairing of guys, straightening of trees to a plumb position, removal of dead material, resetting plants to proper grades or upright position, and maintaining the planting saucer.

1. Plants shall be inspected for watering needs at least twice each week and watered to promote plant growth and vitality.
2. For trees in lawn or mulched beds, apply water to the ground surface directly under the canopy. Water shall be applied at a sufficiently slow rate to prevent run off from the soil surface.
3. Stakes shall be kept plumb and neat in appearance. Guys, wires and anchoring cables shall be tightened and repaired weekly.
4. Planting beds and individual plant pits shall be kept free of weeds, and mulch shall be replaced as required to maintain the specified layer of mulch. Beds and individual pits shall be neat in appearance and maintained to the designed layout.
5. Plants that die during the maintenance period shall be removed and replaced by the Contractor within one week of notification and replaced during that growing season, unless directed otherwise by the Landscape Architect.

6. Spraying for insects, pests and diseases shall conform to the National Arborist Association Standards under the section entitled "Standards for Pesticide Application Operations", as currently adopted and as approved by the Landscape Architect.
7. Work of pruning, fertilizing, spraying, and similar activities shall be undertaken only by Certified Arborists and licensed chemical applicators, as pertinent to the work being performed.

C. During the maintenance period, any decline in the condition of plantings shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional arborists and/or horticulturalists to inspect plant materials and to identify problems and recommend corrective procedures. The Landscape Architect shall be immediately advised of such actions. Inspection and recommendation reports shall be submitted to the Landscape Architect.

3.03 ACCEPTANCE

A. Upon completion of all planting work, the Contractor shall request in writing that the Landscape Architect formally inspect the planting work.

B. If plant materials and workmanship are acceptable, the Landscape Architect will issue a written Certificate of Conditional Acceptance to the Contractor.

C. Following the issuance of the Certificate of Conditional Acceptance to the Contractor, the Contractor shall maintain the plants for a minimum 30 day Monitoring Period. At the end of the Monitoring Period, the plant material will be inspected by the Landscape Architect to determine whether or not all planting work has been performed to the requirements of this Division 32 Section, PLANTS.

D. Acceptance Standards at end of the Monitoring Period: If plant material is reviewed when it is in full leaf, leaves shall be plump with water with a shape indicative of the species and shall be free of insect, pest and disease damage. Twigs shall have living cambium for their full length. Twigs and branches shall have a full bud set for their full length, including terminal buds. Trunks and branches shall be free of frost cracks; sun scald; damage due to insects, pests, and disease; structural defects; and damage resulting from machinery or tools. Plant material inspected and reviewed when the plants are not in full leaf shall have twigs, branches and trunks meeting the above requirements. All plants regardless of the season of review shall have a minimum of 75 percent healthy, balanced branching structure with a healthy terminal leader(s) with viable terminal bud(s).

E. If any number of plants does not meet these Acceptance Standards at the time of inspection, or if in the Landscape Architect’s opinion, workmanship is unacceptable, written notice will be given by the Landscape Architect to the Contractor in the form of a punch list, which itemizes necessary planting replacements and/or other deficiencies to be remedied. The Contractor's responsibility for maintenance of all plants shall be extended until replacements are made or other deficiencies are corrected. All plants that do not meet these Acceptance Standards shall be removed from the project within seven days of receipt of the punch list. Replacements shall conform in all respects to the Specifications for new plants and shall be planted in the same manner.

F. Following the correction of all Punch List deficiencies, the Contractor shall request in writing that the Landscape Architect formally inspect the planting work. If plant materials and workmanship are acceptable, the Landscape Architect will issue a written Certificate of Final Acceptance to the Contractor.

3.04 GUARANTEE

A. The date of the Certificate of Final Acceptance shall establish the beginning of the maintenance period and the commencement of the required one-year guarantee and establishment period for planting work.

B. At the end of the guarantee and establishment period, a final inspection will be held to determine whether any plant material replacements are required. Each plant shall be plumb, shall have a character that is natural for its species as determined by the Landscape Architect, and shall conform to the Acceptance Standards described in this Division 32 Section, PLANTS. Plants found to be unacceptable shall be removed promptly from the site and replaced according to this Division 32 Section, PLANTS. A final inspection will be made after the replacement plants have lived through one year.

C. At the end of the one-year guarantee and establishment period, remove all tree stakes, guys, or anchors installed on trees during the course of the work of this contract.

D. All replacements shall be plants of the same kind and size specified in the PLANT SCHEDULE. The cost shall be borne by the Contractor, except for possible replacements due to vandalism or neglect on the part of others.

END OF SECTION

SECTION 33 11 00
WATER DISTRIBUTION

PART 1 GENERAL

1.01 LOCAL UTILITY SPECIFICATIONS

A. The Contractor shall contact the local authorities to determine if Standard Specifications for Water Distribution are available from the Local Utility District. If Local Utility District specifications are available, the Contractor shall utilize them in lieu of the following specification.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section includes water-distribution piping and specialties outside the building for the following:

1. Water services.
2. Fire-service mains.
3. Combined water service and fire-service mains.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.04 DEFINITIONS

A. Combined Water Service and Fire-Service Main: Exterior water piping for both domestic-water and fire-suppression piping.

B. Fire-Service Main: Exterior fire-suppression-water piping.

C. Water Service: Exterior domestic-water piping.

D. The following are industry abbreviations for plastic materials:

1. PVC: Polyvinyl chloride plastic.

1.05 SUBMITTALS

A. Product Data: For the following:

1. Piping specialties.
2. Valves and accessories.

3. Water meters and accessories when not provided by the utility company.
4. Fire hydrants.

1.06 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of piping and specialties and are based on the specific system indicated.

B. Retain and edit first paragraph and subparagraphs below to suit Project or delete if not applicable.

C. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

D. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.08 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Architect's written permission.

1.09 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.02 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

B. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

C. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.03 PVC PIPE AND FITTINGS

A. PVC, AWWA Pipe: AWWA C900, Class 150, with bell end with gasket and spigot end.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.04 JOINING MATERIALS

A. Transition Couplings:

1. Underground Piping, NPS 1-1/2 and Smaller: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2. Underground Piping, NPS 2 and Larger: AWWA C219, metal, sleeve-type coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Brazing Filler Metals: AWS A5.8, BCuP Series.

C. Soldering Flux: ASTM B 813, water-flushable type.

D. Solder Filler Metal: ASTM B 32, lead-free type with 0.20 percent maximum lead content.

E. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.

F. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.05 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Nonrising-Stem, Resilient-Seated Gate Valves: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.

a. Minimum Working Pressure: 200 psig.

b. End Connections: Mechanical joint.

c. Interior Coating: Complying with AWWA C550.

B. Bronze Gate Valves:

1. OS&Y, Rising-Stem Gate Valves: UL 262, FM-approved bronze body and bonnet, outside screw and yoke, and bronze stem.

a. Minimum Working Pressure: 200 psig.

b. End Connections: Threaded.

2.06 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies: Comply with MSS SP-60. Include sleeve and valve compatible with drilling machine.

1. Tapping Sleeve: Cast- or ductile-iron or stainless steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.

2. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," bottom section with base of size to fit over valve, and approximately 5-inch-diameter barrel.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2.07 CHECK VALVES

A. AWWA Check Valves:

1. Check Valves: AWWA C508, swing-check type with 175-psig working-pressure rating and resilient seat. Include interior coating according to AWWA C550 and ends to match piping.

2.08 CORPORATION VALVES AND CURB VALVES

A. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.

1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.

2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.

B. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

C. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," bottom section with base of size to fit over curb valve, and approximately 3-inch- diameter barrel.

1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.09 WATER METERS

A. Provide water meters of the size and type required by utility company.

2.10 WATER-METER BOXES

A. Description: Cast-iron body and cover for disc-type water meter with lettering "WATER METER" in cover; and slotted, open-bottom base section of length to fit over service piping.

2.11 CONCRETE VAULTS

A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.

B. Ladder: ASTM A 36/A 36M, steel or polyethylene-encased steel steps.

C. Manhole: ASTM A 48, Class No. 35 minimum tensile strength, gray-iron traffic frame and cover.

   1. Dimensions: Not smaller than 24-inch diameter, unless otherwise indicated.

D. Drain: ASME A112.21.1M, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.12 FREESTANDING FIRE HYDRANTS

A. Fire hydrant type shall be as required by utility company.

B. Dry-Barrel Fire Hydrants: AWWA C502, one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure, and 150-psig minimum working-pressure design.

   1. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
   2. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
   3. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
   4. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

2.13 GROUND HYDRANTS

A. Ground hydrants shall be Zurn Z1360 encased, flush type, non-freeze hydrants or approved equal.

2.14 PEDESTAL MOUNTED DRINKING FOUNTAINS

A. Pedestal mounted drinking fountains shall be Haws Corporation 3377FR with 6518FR valve assembly and 6625 valve box or approved equal.

PART 3 EXECUTION

3.01 EARTHWORK

A. Refer to Division 310000 Section "Earthwork" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

C. Do not use flanges, unions, or keyed couplings for underground piping.

D. Flanges, unions, keyed couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground Water-Service Piping: Use the following piping materials for each size range:

1. NPS 3/4 to NPS 3: Soft copper tube, Type K; wrought-copper fittings; and brazed joints.
2. NPS 6 and NPS 8: AWWA C900 Class 200 PVC push-on-joint pipe; mechanical-joint, ductile-iron fittings; and gasketed joints.

3.03 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FM, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
2. Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FM, cast-iron, nonrising-stem gate valves with indicator post.

3.04 JOINT CONSTRUCTION

A. Make pipe joints according to the following:

1. Copper Tubing Soldered Joints: ASTM B 828. Use flushable flux and lead-free solder.
2. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.

3. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.05 PIPING INSTALLATION

A. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

B. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

C. Make connections NPS 2 and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install curb valve in water-service piping with head pointing up and with service box.

A. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

B. Install PVC, AWWA pipe according to AWWA M23 and ASTM F 645.

C. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:

1. Under Driveways: With at least 36 inches cover over top.

D. Install piping by tunneling, jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

E. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water piping systems when those systems are installed.

3.06 ANCHORAGE INSTALLATION

A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.

B. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.07 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.08 WATER-METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written requirements.

B. Water Meters: Install displacement-type water meters, NPS 2 and smaller, in meter boxes with shutoff valves on water-meter inlets. Include valves on water-meter outlets and valved bypass around meters unless prohibited by authorities having jurisdiction.

C. Water Meters: Install compound-type water meters, NPS 3 and larger, in meter vaults. Include shutoff valves on water-meter inlets and outlets and valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

D. Water Meters: Install detector-type water meters in meter vault according to AWWA M6. Include shutoff valves on water-meter inlets and outlets and full-size valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

3.09 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water-meter installation according to utility company's written instructions and requirements.

3.10 VAULT INSTALLATION

A. Install precast concrete vaults according to ASTM C 891.

B. Connect drain outlet to storm drainage piping.

3.11 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. AWWA-Type Fire Hydrants: Comply with AWWA M17.

3.12 GROUND HYDRANTS AND PEDESTAL DRINKING FOUNTAIN INSTALLATION

A. Install ground hydrants and pedestal drinking fountains per manufacturer's recommendations.

3.13 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.14 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-service piping. Locate below finished grade, directly over piping. See Division 310000 Section "Earthwork" for underground warning tapes.

3.15 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

a. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as required by the local utility company.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION

SECTION 33 31 00
SANITARY SEWERAGE

PART 1 GENERAL

1.01 LOCAL UTILITY SPECIFICATIONS

A. The Contractor shall contact the local authorities to determine if Standard Specifications for Sanitary Sewerage are available from the Local Utility District. If Local Utility District specifications are available, the Contractor shall utilize them in lieu of the following specification.

1.02 SUMMARY

A. This Section includes gravity-flow, non-pressure and force-main, pressure sanitary sewerage outside the building, with the following components:
   1. Special fittings for expansion and deflection.
   2. Cleanouts.
   3. Precast concrete manholes.

1.03 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.04 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Non-pressure, Drainage-Piping Pressure Rating: 10-foot head of water.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.06 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Engineer no fewer than five days in advance of proposed interruption of service.
   2. Do not proceed with interruption of service without Engineer's written permission.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

2.03 PVC PIPE AND FITTINGS

A. PVC Gravity Sewer Pipe and Fittings: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.04 NONPRESSURE-TYPE PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.05 CLEANOUTS

A. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.06 MANHOLES

A. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

1. Diameter: 48 inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness, and of length to provide depth indicated.

5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

7. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.

8. Steps: Individual FRP steps, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.

9. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.

10. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."

    a. Material: ASTM A 48/A 48M, Class 35 gray iron, unless otherwise indicated.

    b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint; 15-mil minimum thickness applied to all surfaces, unless otherwise indicated.

2.07 CONCRETE

A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.

2. Fine Aggregate: ASTM C 33, sand.

3. Coarse Aggregate: ASTM C 33, crushed gravel.

4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.

2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.

2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

PART 3 EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 310000 Section "Earthwork."

3.02 PIPING APPLICATIONS

A. Gravity-Flow, Nonpressure Sewer Piping: Use the following pipe materials:

1. PVC sewer pipe and fittings, gaskets, and gasketed joints conforming to ASTM D 3034 SDR 35.

3.03 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.B

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or combination of both.

F. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
2. Install piping below frost line.
3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.04 PIPE JOINT CONSTRUCTION

A. Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

B. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.

3.05 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 2 inches above finished surface elsewhere, unless otherwise indicated.

3.06 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use PVC pipe fittings in sewer pipes at branches for cleanouts and PVC pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use medium-duty, top-loading classification cleanouts in earth, unpaved foot-traffic and in paved foot-traffic areas.
2. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.

B. Set cleanout frames and covers in asphalt pavement and earth in cast-in-place-concrete block, 24 by 24 by 6 inches deep. Set with tops flush with pavement and 1 inch above surrounding grade when in earth.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.07 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains.

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping.
2. Make branch connections into existing underground manholes by coring and installing a rubber boot as approved by the local utility provider.

3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.08 IDENTIFICATION

A. Materials and their installation are specified in Division 310000 Section "Earthwork." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

3.09 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

a. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.

b. Close openings in system and fill with water.

c. Purge air and refill with water.

d. Disconnect water supply.

e. Test and inspect joints for leaks.

f. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section. Use test pressure of at least 10 psig.

6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
   a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
   b. Option: Test concrete gravity sewer piping according to ASTM C 924.
7. Manholes: Perform hydraulic test according to ASTM C 969.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. Clean interior of piping of dirt and superfluous material. Flush with potable water.

END OF SECTION

SECTION 33 41 00
STORM SEWERS AND PIPE CULVERTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This work shall consist of the placing of precast concrete pipe, corrugated metal pipe, structural plate pipe and pipe arches, high density polyethylene (HDPE) corrugated pipe (with smooth waterway), and all fittings as called for on the drawings and in accordance with the Specifications including trench excavation, bedding, and backfill.

B. Each pipe shall be clearly marked to show its class or gauge, date of manufacture, name of manufacturer, and mark of approval by an approved commercial testing laboratory prior to delivery.

C. All pipe and special fitting shall be new materials, which have not been previously used and free of any defects or damage.

D. Pipe sizes, class or gauge, and type of bituminous coating will be shown on the drawings. Size of the pipe is nominal inside diameter.

E. All materials used in this construction, in addition to the general requirement of these Specifications, unless otherwise stipulated, shall conform to the following:

1. Storm sewers and pipe culverts shall conform to Subsection 607 of the Tennessee Department of Transportation, Standard Specifications for Road and Bridge Construction, 1981 or latest revisions.

2. HDPE pipe shall conform to AASHTO M252, M294, MP7 and shall be dither AASHTO Type “S: or AASHTO Section 30 or ASTM D2321 and any details shown on the drawings or as recommended by the manufacturer.

1.02 EXISTING UTILITIES

A. All existing sewers, water lines, gas lines, underground conduits, telephone lines, electric lines or other utilities or structure in the vicinity of the work shall be carefully protected by the Contractor from damage at all times.

END OF SECTION

SECTION 33 49 00
STORM DRAINAGE STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This work shall consist of constructing the following drainage structures: manholes, catch basins, inlets and junction boxes. Construction shall be in reasonable close conformity to the lines, grades, dimension and sizes shown on the drawings or as directed by the Engineer.

B. The height or depth of these drainage structures will vary with location, but unless otherwise shown on the drawings, shall be such that the frames will match the line and grades of the parking area, roadway surface or grasses areas and the invert will be at the designated elevations.

C. Cast iron frames, grates, and covers shall be provided as specified on the drawings.

D. Manholes, inlets, catch basins, and junction boxes shall conform to the Standard Detail Drawings of the Tennessee Department of Transportation unless otherwise noted on the drawings. Deviations from these drawings may be approved, by submitting a detailed drawing to the Engineer before construction begins.

E. All materials used in this construction, in addition to the general requirements of these Specifications, unless otherwise stipulated, shall conform to the following:

1. Drainage structures shall conform to Subsection 611 of the Tennessee Department of Transportation, Standard Specifications for Road and Bridge Construction, 1981 or latest revisions.

END OF SECTION

General Information about the Supplier	
Sign Your Name to the Right of the Arrow	
Your signature indicates you read and agree to "KCDC's General Instructions to Suppliers" (**www.kcdc.org)** and that you are authorized to bind the supplier or are submitting the response on behalf of and at the direction of the suppliers' representative authorized to contractually bind the supplier. I represent that the supplier or its applicable representative(s) has reviewed the information contained in this Solicitation Package and that the information submitted is accurate.	
Printed Name and Title	
Company Name	
Street Address	
City/State/Zip	
Contact Person (Please Print Clearly)	
Telephone Number	
Cell Number	
Supplier's E-Mail Address (Please Print Clearly)	

Addenda

Addenda are at www.kcdc.org. **Click on "Procurement" and then on "Open Solicitations" to find addenda. Please check for addenda prior to submitting a proposal.**

Acknowledge addenda have been issued by checking below as appropriate:

None ☐	**Addendum 1** ☐	**Addendum 2** ☐	**Addendum 3** ☐	**Addendum 4** ☐	**Addendum 5** ☐

Statistical Information (Check all the apply)

This business is at least 51% owned and operated by a woman	**Yes** ☐ **No** ☐
This business qualifies as a small business by the State of Tennessee *Total gross receipts of not more than $10,000,000 average over a three-year period* ***OR*** *employs no more than 99 persons on a full-time basis*	**Yes** ☐ **No** ☐
This business qualifies as a Section 3 business by defined herein	**Yes** ☐ **No** ☐

This business is owned & operated by persons at least 51% of the following ethnic background:

Asian/Pacific ☐	Black ☐	Hasidic Jew ☐	Hispanic ☐	Native American ☐	White ☐	Publicly Owned ☐

Prompt Payment Discount

A prompt payment discount of _____% is offered for payment within ____ days of submission of an accurate and proper invoice.

Insurance

I have reviewed the insurance requirements and will comply with them without exception. Yes ☐ No ☐

Pursuant to and in compliance with the solicitation documents, the supplier signing Solicitation Document A, having thoroughly examined the work to be performed, agrees to perform the work for the following total bid amount for the above referenced project. The prices quoted cover all of the supplier's expenses including, but not limited to, overhead, profit, insurance, subcontractors, supplies and bonding.

Complete all "blanks"-even if the amount is $0.00

Cost Information	
Total Project Cost	**$**

Deduct Alternates	
Alternate No. 1: Window Treatment Alternate If Alternate "1" is accepted, the supplier shall provide all material, equipment, labor and supervision necessary to construct / install Faux Wood Blinds, per Finish Schedule & Legends, in lieu of composite blinds.	+$

Unit Prices –Construction of Multifamily Housing Phase 1 of Austin Homes Redevelopment C20007		
Description	**Cost**	**Unit of Measure**
Unit Price No. 1: Undercut and off-site disposal of unsuitable soil in trenches and replace with crushed stone	$	Cubic Yard
Unit Price No. 2: Undercut and off-site disposal of unsuitable soil in mass excavation and replace with compacted soil	$	Cubic Yard
Unit Price No. 3: Removal and off-site disposal of trench rock	$	Cubic Yard
Unit Price No. 4: Removal and disposal of mass rock	$	Cubic Yard
Unit Price No. 5: Flowable fill	$	Cubic Yard

Supplier: _____

Conflict of Interest:

1. No commissioner or officer of KCDC or other person whose duty it is to vote for, let out, overlook or in any manner superintend any of the work for KCDC has a known direct interest in the award or the supplier providing goods or services.

2. No employee, officer or agent of the grantee or sub-grantee will participate in selection, or in the award or administration of an award supported by federal funds if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when the employee, officer or agent, any member of his immediate family, his or her partner, or an organization, which employs, or is about to employ, any of the above, has a financial or other interest in the supplier selected for award.

3. The grantee's or sub-grantee's officers, employees or agents will neither solicit nor accept gratuities, favors or anything of monetary value from suppliers, potential suppliers, or parties to sub-agreements.

4. By submission of this form, the supplier is certifying that no conflicts of interest exist.

Drug Free Workplace Requirements:

5. Private employers with five or more employees desiring to contract for construction services attest that they have a drug free workplace program in effect in accordance with TCA 50-9-112.

Eligibility:

6. The supplier is eligible for employment on public contracts because no convictions or guilty pleas or pleas of nolo contender to violations of the Sherman Anti-Trust Act, mail fraud or state criminal violations with an award from the State of Tennessee or any political subdivision thereof have occurred.

General:

7. Supplier fully understands the preparation and contents of the attached offer and of all pertinent circumstances respecting such offer.

8. Such offer is genuine and is not a sham offer.

Iran Divestment Act:

9. Concerning the Iran Divestment Act (TCA 12-12-101 et seq.), by submission of this bid/quote/quotes, each supplier and each person signing on behalf of any supplier certifies, and in the case of a joint bid/quote/quotes, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each supplier is not on the list created pursuant to § 12-12-106.

Non-Collusion:

10. Neither the said supplier nor any of its officers, partners, KCDC, agents, representatives, employees or parties interest, including this affiant, has in any way colluded conspired, connived or agreed, directly or indirectly, with any other responder, supplier, or person to submit a collusive or sham offer in connection with the award or agreement for which the attached offer has been submitted or to refrain from making an offer in connection with such award or agreement, or collusion or communication or conference with any other supplier, or, to fix any overhead, profit, or cost element of the offer price or the offer price of any other supplier, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against KCDC or any person interested in the proposed award or agreement.

11. The price or prices quoted in the attached offer are fair, proper and not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the supplier or any of its agents, representatives, KCDC, employees, or parties in interest, including this affiant.

Accuracy of Electronic Copies:

12. If the supplier provides electronic copies of the bid/proposal/quote to KCDC, the supplier certifies that the information provided on paper and in the electronic format is identical unless specifically noted otherwise.

No Contact/No Advocacy Affidavit

13. After this solicitation is issued, any contact initiated by any supplier or proposer with any owner's representative concerning this proposal is strictly prohibited-except for communication with the Procurement Division. My signature signifies that no unauthorized contact occurred.

14. To ensure the integrity of the review and evaluation process, respondents to this solicitation nor any firm representing them, may not lobby or advocate to owner's staff or Board members. My signature signifies that no unauthorized advocacy occurred.

The undersigned hereby acknowledges receipt of these affidavits and certifies that the submittal in response to this solicitation is in full compliance with the listed requirements.

Signed by	
Printed Name	
Title	
Subscribed and sworn to before me this date	
By (Notary Public)	
My Commission Expires on	
Notary Stamp	

Representations, Certifications, and Other Statements of Bidders

Public and Indian Housing Programs

Table of Contents

1. Certificate of Independent Price Determination

(a) The bidder certifies that--

(1) The prices in this bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to (i) those prices, (ii) the intention to submit a bid, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this bid have not been and will not be knowingly disclosed by the bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a competitive proposal solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the bidder to induce any other concern to submit or not to submit a bid for the purpose of restricting competition.

(b) Each signature on the bid is considered to be a certification by the signatory that the signatory--

(1) Is the person in the bidder's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(l) through (a)(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(l) through (a)(3) above.

_____ *[insert full name of person(s) in the bidder's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the bidder's organization];*

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the bidder deletes or modifies subparagraph (a)2 above, the bidder must furnish with its bid a signed statement setting forth in detail the circumstances of the disclosure.

☒ [Contracting Officer check if following paragraph is applicable]

(d) Non-collusive affidavit. (applicable to contracts for construction and equipment exceeding $50,000) ● in Solicitation Document B attached

(1) Each bidder shall execute, in the form provided by the PHA/IHA, an affidavit to the effect that he/she has not colluded with any other person, firm or corporation in regard to any bid submitted in response to this solicitation. If the successful bidder did not submit the affidavit with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the affidavit by that date may render the bid nonresponsive. No contract award will be made without a properly executed affidavit.

(2) A fully executed "Non-collusive Affidavit" [ ] is, [ ] is not included with the bid.

2. Contingent Fee Representation and Agreement

(a) Definitions. As used in this provision:

"Bona fide employee" means a person, employed by a bidder and subject to the bidder's supervision and control as to time, place, and manner of performance, who neither exerts, nor proposes to exert improper influence to solicit or obtain contracts nor holds out as being able to obtain any contract(s) through improper influence.

"Improper influence" means any influence that induces or tends to induce a PHA/IHA employee or officer to give consideration or to act regarding a PHA/IHA contract on any basis other than the merits of the matter.

(b) The bidder represents and certifies as part of its bid that, except for full-time bona fide employees working solely for the bidder, the bidder:

(1) [ ] has, [ ] has not employed or retained any person or company to solicit or obtain this contract; and

(2) [ ] has, [ ] has not paid or agreed to pay to any person or compan employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

(c) If the answer to either (a)(1) or (a)(2) above is affirmative, the bidder shall make an immediate and full written disclosure to the PHA/IHA Contracting Officer.

(d) Any misrepresentation by the bidder shall give the PHA/IHA the right to (1) terminate the contract; (2) at its discretion, deduct from contract payments the amount of any commission, percentage, brokerage, or other contingent fee; or (3) take other remedy pursuant to the contract.

3. Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions (applicable to contracts exceeding $100,000)

(a) The definitions and prohibitions contained in Section 1352 of title 31, United States Code, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The bidder, by signing its bid, hereby certifies to the best of his or her knowledge and belief as of December 23, 1989 that:

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of a contract resulting from this solicitation;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the bidder shall complete and submit, with its bid, OMB standard form LLL, "Disclosure of Lobbying Activities;" and

(3) He or she will include the language of this certification in all subcontracts at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

(d) Indian tribes (except those chartered by States) and Indian organizations as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) are exempt from the requirements of this provision.

4. Organizational Conflicts of Interest Certification

The bidder certifies that to the best of its knowledge and belief and except as otherwise disclosed, he or she does not have any organizational conflict of interest which is defined as a situation in which the nature of work to be performed under this proposed contract and the bidder's organizational, financial, contractual, or other interests may, without some restriction on future activities:

(a) Result in an unfair competitive advantage to the bidder; or,

(b) Impair the bidder's objectivity in performing the contract work.

[ ] In the absence of any actual or apparent conflict, I hereby certify that to the best of my knowledge and belief, no actual or apparent conflict of interest exists with regard to my possible performance of this procurement.

5. Bidder's Certification of Eligibility

(a) By the submission of this bid, the bidder certifies that to the best of its knowledge and belief, neither it, nor any person or firm which has an interest in the bidder's firm, nor any of the bidder's subcontractors, is ineligible to:

(1) Be awarded contracts by any agency of the United States Government, HUD, or the State in which this contract is to be performed; or,

(2) Participate in HUD programs pursuant to 24 CFR Part 24.

(b) The certification in paragraph (a) above is a material representation of fact upon which reliance was placed when making award. If it is later determined that the bidder knowingly rendered an erroneous certification, the contract may be terminated for default, and the bidder may be debarred or suspended from participation in HUD programs and other Federal contract programs.

6. Minimum Bid Acceptance Period

(a) "Acceptance period," as used in this provision, means the number of calendar days available to the PHA/IHA for awarding a contract from the date specified in this solicitation for receipt of bids.

(b) This provision supersedes any language pertaining to the acceptance period that may appear elsewhere in this solicitation.

(c) The PHA/IHA requires a minimum acceptance period of 90 calendar days.

(d) In the space provided immediately below, bidders may specify a longer acceptance period than the PHA's/IHA's minimum requirement. The bidder allows the following acceptance period: calendar days.

(e) A bid allowing less than the PHA's/IHA's minimum acceptance period will be rejected.

(f) The bidder agrees to execute all that it has undertaken to do, in compliance with its bid, if that bid is accepted in writing within (1) the acceptance period stated in paragraph (c) above or (2) any longer acceptance period stated in paragraph (d) above.

7. Small, Minority, Women-Owned Business Concern Representation

The bidder represents and certifies as part of its bid/ offer that it --

(a) [ ] is, [ ] is not a small business concern. "Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding, and qualified as a small business under the criteria and size standards in 13 CFR 121.

(b) [ ] is, [ ] is not a women-owned business enterprise. "Women-owned business enterprise," as used in this provision, means a business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business.

(c) [ ] is, [ ] is not a minority business enterprise. "Minority business enterprise," as used in this provision, means a business which is at least 51 percent owned or controlled by one or more minority group members or, in the case of a publicly owned business, at least 51 percent of its voting stock is owned by one or more minority group members, and whose management and daily operations are controlled by one or more such individuals. For the purpose of this definition, minority group members are:

(Check the block applicable to you)

[ ] Black Americans
[ ] Hispanic Americans
[ ] Native Americans
[ ] Asian Pacific Americans
[ ] Asian Indian Americans
[ ] Hasidic Jewish Americans

9. Certification of Eligibility Under the Davis-Bacon Act (applicable to construction contracts exceeding $2,000)

(a) By the submission of this bid, the bidder certifies that neither it nor any person or firm who has an interest in the bidder's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of the contract resulting from this solicitation shall be subcontracted to any person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

10. Certification of Nonsegregated Facilities (applicable to contracts exceeding $10,000)

(a) The bidder's attention is called to the clause entitled **Equal Employment Opportunity** of the General Conditions of the Contract for Construction.

(b) "Segregated facilities," as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

(c) By the submission of this bid, the bidder certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The bidder agrees that a breach of this certification is a violation of the Equal Employment Opportunity clause in the contract.

(d) The bidder further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) prior to entering into subcontracts which exceed $10,000 and are not exempt from the requirements of the Equal Employment Opportunity clause, it will:

(1) Obtain identical certifications from the proposed subcontractors;

(2) Retain the certifications in its files; and

(3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

Notice to Prospective Subcontractors of Requirement for Certifications of Nonsegregated Facilities

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Employment Opportunity clause of the prime contract. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

Note: The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

11. Clean Air and Water Certification (applicable to contracts exceeding $100,000)

The bidder certifies that:

(a) Any facility to be used in the performance of this contract [ ] is, [ ] is not listed on the Environmental Protection Agency List of Violating Facilities:

(b) The bidder will immediately notify the PHA/IHA Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the bidder proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and,

(c) The bidder will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

12. Bidder's Signature

The bidder hereby certifies that the information contained in these certifications and representations is accurate, complete, and current.

(Signature and Date) _____

(Typed or Printed Name) _____

(Title) _____

(Company Name) _____

(Company Address)

Previous edition is obsolete

form **HUD-5369-A** (11/92)

The supplier must demonstrate a good faith effort to utilize Minority Owned Businesses (MOB) and Woman Owned Businesses (WOB). To assist in this effort, KCDC posts the web links of organizations, which can provide suppliers with a list of minority and women owned businesses, on its web site. These lists are useful in preparing a response to this solicitation.

Place a checkmark in either Section One or Section Two of this form. Provide the information in Section One if you check that box.

Section One ☐ The following companies were asked for pricing for the attached bid. Provided the listed companies meet bid document requirements and their pricing is competitive, it is our intent to use the companies listed. Attached hereto or to be provided to KCDC within five calendar days of solicitation opening is our Form of Commitment/Statement of Effort (failure to submit the Form of Commitment/Statement of Effort may result in ***rejection*** of your bid.)

Company Name	Person	Product/Service	MOB	WOB

Section Two ☐ MOB/WOB's were not contacted because sub-suppliers/contractors will not be needed to complete the contract and all work will be completed by the supplier. Other MOB/WOB's not shown above, will be considered during the duration of the contract in the event the supplier decides additional subcontractors or supplier will be used (to complete all or part of the contract).

Signed by	
Print Name and Title	
Subscribed and Sworn to before me on this date	
By	
Notary Public (stamp/signature)	
My Commission Expires on	

Place a checkmark in either Section One or Section Two of this form.

Section One Does not apply - MOB/WOB subcontractors will not be used. ☐ (Stop Here)
Section Two MOB/WOB Subcontractors will be used. ☐ (Complete this page)

I, _____ do certify the supplier has or will enter into a formal agreement with the MOB/WOB enterprise for work listed in this schedule.

Supplier Name	MOB	WOB	Contact Person	Type of Supplies to be Provided	Type of Work to be Performed	Dollar Value of Supplies or Service

COMPLETE THE FOLLOWING BOXES IF BOX ABOVE WAS NOT COMPLETED

The following companies were listed on the Good Faith Compliance Affidavit submitted with my bid.

Company Name	Person	Product/Service	MOB	WOB

Explain why each of the above companies could not be used to provide the needed products or services.

Company Name	Reason

Above information submitted by _____

Printed/Typed Name and Title:_____

Suppliers will provide narrative remarks and details of how they intend to address any supply chain disruptions due to Acts of God, epidemics, pandemics, tariffs and other similar events. Discuss:

- How labor disruptions will be alleviated
- How supply delays/disruptions will be alleviated
- Your previous experience with suppliers and subs during such events and how successful they were in continuation
- Your overall past experience dealing with such issues and resulting success
- Covid-19 related delays or challenges of current projects and what impact it may or may not have on budget and schedule

Note: This information may be used to assist in the determination as to whether or not your bid and Company are "responsible" as detailed in paragraph 11.

1. INSURANCE

The Supplier shall maintain, at Supplier's sole expense, on a primary and non-contributory basis, at all times during the life of the contract insurance coverages, limits, and endorsements described herein. All insurance must be underwritten by insurers with an A.M. Best rating of A- : IX or better. Upon award, the Supplier shall provide Certificate(s) of Insurance and amendatory endorsements to KCDC evidencing said insurance coverages. **See paragraph "h" for exact naming of certificate holders, additional insureds and mortgage interest**.

The Supplier agrees the insurance requirements herein as well as KCDC's review or acknowledgement, is not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by the Supplier under this contract. KCDC's failure to require a Certificate of Insurance, acceptance of a non-conforming certificate, or allowing the Supplier to commence work shall not operate as a waiver of these minimum insurance requirements or the liabilities and obligations assumed by the Supplier under this contract.

a. Commercial General Liability Insurance and Umbrella Liability Insurance: occurrence version general liability insurance including contractual liability with minimum limits of $1,000,000 per occurrence and $2,000,000 in the aggregate covering the following perils: bodily injury, personal injury, and broad form property damage including products/completed operations for one year after completion of the Project(s). Limits must apply separately to the work/location in this contract.

Umbrella Liability: Umbrella Liability Insurance with a minimum limit of $5,000,000 per each occurrence and aggregate combined single limit for all liability with a $10,000 self-insured retention for exposure not covered in underlying primary policies. The policy shall name the Commercial General Liability and Automobile Liability in its underlying schedule.

Such insurance shall contain or be endorsed to contain a provision that includes **Owner and Owner Entities listed in paragraph "h"** as additional insureds with respect to the Supplier's ongoing and completed operations, providing coverage at least as broad as CG 20 10 07 04 and 20 37 07 04 endorsements. The coverage shall contain no special limitations on the scope of its protection afforded to the listed insureds.

b. Commercial Automobile Liability Insurance: in an amount not less than $1,000,000 (combined single limit) for all owned, hired, and non-owned vehicles utilized by Supplier in connection with the Project. Coverage is to include coverage for loading and unloading hazards.

Such insurance shall contain or be endorsed to contain a provision that includes **Owner and Owner Entities listed in paragraph "h"** as additional insureds.

c. Workers' Compensation Insurance and Employers' Liability Insurance: Workers' Compensation Insurance with statutory limits as required by the State of Tennessee or other applicable laws. Employers' Liability Insurance with a limit of not less than $500,000.

d. **Pollution Liability Insurance:** coverage, providing defense and indemnity coverage for bodily injury, property damage, and environmental investigation and clean-up costs for pollution conditions arising from the Contractor's operations. Limit of liability not less than $1,000,000 each occurrence and $2,000,000 annual aggregate. The policy shall include a minimum three (3) year Discovery (tail) reporting period, and a Retroactive Date that equals or precedes the effective date of this contract or the performance of work hereunder. Coverage may be provided on a per project basis.

e. **Builder's Risk:** coverage shall be written on an All-Risk, Replacement Cost, and Completed Value Form basis in an amount at least equal to one-hundred percent (100%) of the projected completed value of the Work, as well as subsequent modifications of that sum due to Change Order(s). Supplier agrees to be responsible for reporting increases in the projected completed value of the work due to Change Order(s).

Coverage shall insure *without limitation* against the perils of fire and extended coverage and physical loss or damage including, but not limited to, theft, vandalism, malicious mischief, collapse, windstorm, testing and startup, temporary buildings, portions of the work stored off site, all portions of the work in transit, debris removal including demolition occasioned by enforcement of any applicable legal requirements and shall cover reasonable compensation for Architect's and Supplier's services and expenses required as a result of such insured loss. Insurance is to cover all property of Suppler (and its subcontractors), Owner and all certificate holders as their interest may appear. Coverage shall cover the completed value of the construction including without limitation, slab on grade, excavations, foundations, caissons, tenant finish work, and retaining walls around the perimeter of the project. Any exclusion of so-called underground damage to pipes, collapse of structure, or damage resulting from explosion or blasting shall be deleted. Such policy shall provide that any loss thereunder shall be payable to the Supplier, Owner, and others as their interests may appear and shall also have a replacement cost endorsement.

Debris Removal shall be no less than $250,000 for removal from a casualty loss and no less than $10,000 for debris removal of pollutants.

Coverage shall include soft costs resulting from damage or destruction to insured property on-site and while in transit including flood, earthquake and earth movement when such perils are required. Such insurance shall cover continuing expenses not directly involved in the direct cost of construction/renovation, including expense incurred upon money borrowed to finance construction or repair, continuing interest on mortgage loans, advertising, promotion, realty taxes and other assessments, the cost to the insured of additional commissions incurred upon re-negotiating leases, loss of earnings and rents and other expenses incurred as a result of property loss or destruction by an insured peril.

f. **Other Insurance Requirements:**

1. Upon award, Supplier shall furnish KCDC with original Certificate(s) of Insurance and amendatory endorsements effecting coverage required by this section.

2. Provide a waiver of subrogation **for each required policy herein**.
3. When required by the insurer, or should a policy condition not permit Supplier to enter into

a pre-loss agreement to waive subrogation without an endorsement, the policy should be endorsed with a Waiver of Transfer of Rights of Recovery Against Others, or its equivalent. This waiver of subrogation requirement shall not apply to any policy which includes a condition specifically prohibiting such an endorsement, or voids coverage should supplier enter into such an agreement on a pre-loss basis.

4. **Not less than 30-days prior written cancellation notice and no less than 10-days for non-payment of premium** for all insurances (by endorsement if necessary) is required.

5. Replace certificates, policies, and endorsements for any such insurance expiring prior to completion of services.

6. Maintain such insurance from the time services commence until services are completed or through such extended discovery/reporting/tail period as required. Failure to maintain or renew coverage or to provide evidence of renewal may be treated by KCDC as a material breach of contract.

7. Any deductibles and/or self-insured retentions greater than $50,000 must be disclosed to and approved by KCDC prior to the commencement of services. Use of large deductibles and/or self-insured retentions will require proof of financial ability as determined by KCDC.

8. All policies must be written on an occurrence basis with the exception of Errors and Omissions Liability (E & O) / Professional Liability and Pollution Liability which may be claims made coverage.

8. Require all subcontractors to maintain during the term of the resulting contract commercial general liability insurance, automobile liability insurance, and workers' compensation insurance (unless subcontractor's employees are covered by Supplier's insurance) in the same manor and limits as specified for the Supplier

g. Certificate Holders, Additional Insureds, and Mortgage Interests:

Bell Street LP
901 N Broadway
Knoxville, TN 37917

Bell Street Corporation
901 N Broadway
Knoxville, TN 37917

KCDC, its officials, officers, employees, and volunteers
901 N Broadway
Knoxville, TN 37917

Pinnacle Bank and Pinnacle Community Development SLP, Inc. (also include as Mortgage Interest)
ISAOA/ATIMA
P.O. Box 702726
Dallas, TX 75370

Any other lender, investor, interest as required.

h. **Right to Revise or Reject:** KCDC reserves the right to revise any insurance requirement, including but not limited to, limits, coverages, and endorsements based on changes in scope of work/specifications, insurance market conditions affecting the availability or affordability of coverage.

i. **No Representation of Coverage Adequacy:** The coverages, limits or endorsements required herein protect the primary interests of KCDC, and the Supplier agrees in no way should these coverages, limits or endorsements required be relied upon when assessing the extent or determining appropriate types and limits of coverage to protect the Supplier against any loss exposures, whether as a result of the project or otherwise.

All limits indicated are minimums required.

Term Sheet - Insurance Requirements
Bell Street Construction C20007

Certificate Holders & Additional Insureds *(see below)*	Bell Street LP Bell Street Corporation KCDC Pinnacle Bank and Pinnacle Community Development SLP, Inc.
Mortgage Interest (see below)	Pinnacle Bank and Pinnacle Community Development SLP, Inc.
GL – including Contractual Liability ***(Supplier & Subcontractors)***	$1M / $2M
Umbrella ***(Supplier)****)*	$5M
Auto ***(Supplier & Subcontractors)***	$1M (owned, hired, & non-owned)
WC ***(Supplier & Subcontractors)***	Statutory limits
Employers' Liability ***(Supplier & Subcontractors)***	$500,000
Pollution ***(Supplier)***	$1M / $2M with 3 year Discovery; with Retro Date at least equal to contract date
Builder's Risk ***(Supplier)***	100% of projected completed value
30-day cancellation ***(Supplier & Subcontractors)***	Required– must indicate on COI
Primary non-contributory ***(Supplier & Subcontractors)***	Required – must indicate on COI
Waiver of Subrogation ***(Supplier & Subcontractors)***	Required for all coverages – must indicate on COI

All limits indicated are minimums required.
Certificates may be grouped as follows:

1. **Bell Street LP**
   Bell Street Corporation
   Knoxville's Community Development Corporation (KCDC), its officials, officers, employees, and volunteers
   901 N Broadway
   Knoxville, TN 37917

2. **Pinnacle Bank and Pinnacle Community Development SLP, Inc.**
   ISAOA/ATIMA
   P.O. Box 702726
   Dallas, TX 75370

<u>This appendix does not need returned</u>

Solicitation Document G Envelope Coversheet for Construction of Multifamily Housing Phase 1 of Austin Homes Redevelopment C20007

State Law requires certain State license information on the front of your bid envelope. You are responsible for providing the correct information on the envelope front but KCDC provided this form to guide you. Failure to supply this information may invalidate your bid. **Attach this completed page to the front of your bid envelope**

Bid Due Date/Time	06-09-20 at 2:00 p.m.
State of Tennessee License Holder Name	
State of Tennessee License Number	
Pertinent State of Tennessee License Classification	
State of Tennessee License Expiration Date	

Subcontractors to be used on this project (If subcontract work is not required, write "none required")

Electrical Subcontractor Name on the State of Tennessee's License		**State of Tennessee License Number**	
State of Tennessee License Classification(s)		**Expiration Date of State License**	
HVAC Subcontractor Name on the State of Tennessee's License		**State of Tennessee License Number**	
State of Tennessee License Classification(s)		**Expiration Date of State License**	
Masonry Subcontractor Name on the State of Tennessee's License		**State of Tennessee License Number**	
State of Tennessee License Classification(s)		**Expiration Date of State License**	
Plumbing Subcontractor Name on the State of Tennessee's License		**State of Tennessee License Number**	
State of Tennessee License Classification(s)		**Expiration Date of State License**	

Advisements:

1. KCDC will not consider notes changing the bid written on the bid envelope.
2. For the listed subcontractor types above, you may only list one firm.
3. State requirement information is at **https://www.tn.gov/commerce/regboards/contractors.html**