




Terry McKee, IT & Procurement Director

901 N. Broadway • Knoxville, TN 37917-6699
 865.403.1133 • Fax 865.594.8858
purchasinginfo@kcdc.org
www.kcdc.org

Invitation for Sealed Bids

Five Points Infill Housing Construction Phase 3

Solicitation Number	C18016
Due Date	December 5, 2017
Due Time	2:00 p.m. eastern standard time
Deliver Responses to:	Knoxville’s Community Development Corporation Procurement Division 901 N. Broadway Knoxville, TN 37917  Note: Procurement is in a separate building behind the main office building
Electronic Copies:	Electronic copies are available on KCDC’s webpage or by email at purchasinginfo@kcdc.org .
May responses be emailed to KCDC	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Paper copies must also be provided, if the solicitation so indicates.
Solicitation Meeting	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Solicitation Meeting is Mandatory	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Solicitation Meeting Date	November 7, 2017
Solicitation Meeting Time	9:00 a.m.
Solicitation Meeting Location	KCDC’s Board Room at 901 N. Broadway. Come to the Lobby in the Main Building and go upstairs.
Questions About This Solicitation	Submit questions to purchasinginfo@kcdc.org
Award Results	KCDC posts both a summary of the quotes received and the award decision to its web page at: http://www.kcdc.org/procurement/

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. KCDC also oversees approximately 3958 Section 8 Vouchers, 82 Moderate Rehabilitation units and 20 Redevelopment areas.
- b. KCDC is seeking sealed bids from qualified suppliers to construct 80 residential units for the Five Points Phase 3.
- c. The supplier shall furnish all supervision, labor, materials, tools, equipment, services and permits necessary to perform and complete the work within the project timeline.
- d. KCDC reserves the right to ask the supplier successful with this firm fixed price bid, for a firm fixed fee for Phase 4 construction-if KCDC so desires. The scope of that development has yet to be determined.

2. **BONDS**

Bid, payment and performance bonds are required if the bid exceeds \$100,000 in value. Bonding requirements include:

- a. A bid guarantee 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 and ordinances and orders that are in effect at the time the work is performed.

5. **CONTACT POLICY**

The supplier may not contact an officer, agent or employee of KCDC other than the KCDC's Procurement Division about matters pertaining to this solicitation, from the issuance of this solicitation until its award. Information obtained from an unauthorized officer, agent or employee of KCDC will not affect the risks or obligations assumed by the supplier or relieve the supplier from fulfilling any of the conditions of the project. Such contact can disqualify the supplier from participation in the solicitation process.

6. **CONTRACT APPROVAL**

The resulting contract is subject to the approval of the KCDC Board at a regular meeting.

7. **CONTRACT DOCUMENTS**

KCDC has posted a prototype of its 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.
- b. Have sufficient personnel to complete the work in a timely manner.
- c. Enforce strict discipline and good order 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 KCDC'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. **ENTRANCE TO SITES**

Supplier employees are not to be on KCDC premises unless they are working on a KCDC project. Acquaintances, family members, assistants, or any person not working on KCDC's behalf will not accompany employees on KCDC sites.

11. **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.

12. **EVALUATION**

KCDC will evaluate this as a formal sealed bid and the award is to the "lowest and best." All responses are subject to a determination of "responsive" and "responsible" prior to award. KCDC is the sole judge as to supplier "responsiveness" and "responsibility." KCDC reserves the right to request additional information to assist in the evaluation process; this includes references and business capacity information.

13. **GENERAL INSTRUCTIONS**

KCDC does not insert "General Instructions to Suppliers" in solicitation documents. These instructions 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."

14. **INSURANCE**

The contractor shall maintain, at contractor'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:VI or better. Upon award, the contractor shall provide Certificate(s) of Insurance to KCDC evidencing said insurance coverages.

The contractor 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 contractor under this contract

- a. *Commercial General Liability Insurance:* occurrence version commercial general liability insurance with a limit of not less than \$2,000,000 each occurrence for bodily injury, personal injury, property damage, and products and completed operations. If such insurance contains a general aggregate limit, it shall apply separately to the work/location in this contract or be no less than \$3,000,000.

Such insurance shall contain or be endorsed to contain a provision that includes KCDC, its officials, officers, employees, and volunteers as additional insureds with respect to liability arising out of work or operations performed by or on behalf of the contractor including materials, parts, or equipment furnished in connection with such work or operations. The coverage shall contain no special limitations on the scope of its protection afforded to the above-listed insureds.

The Additional Insured shall read "Knoxville's Community Development Corporation (KCDC)".

If necessary, umbrella/excess liability insurance can be used in conjunction with the general liability insurance to meet these requirements. Unless the umbrella/excess liability insurance provides coverage on a pure/true follow-form basis, or KCDC is automatically defined as an additional insured, the contractor shall add by endorsement, KCDC its officials, officers, employees, and volunteers as an additional insured.

- b. *Automobile Liability Insurance:* including vehicles owned, hired, and non-owned, with a combined single limit of not less than \$1,000,000 each occurrence. Such insurance shall include coverage for loading and unloading hazards.
- c. *Workers' Compensation Insurance and Employers Liability Insurance:* with statutory limits as required by the State of Tennessee or other applicable laws.
- d. *Pollution Liability Insurance:* pollution liability 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. *Other Insurance Requirements:* Contractor shall:
 - 1. Upon award, furnish KCDC with original Certificates of Insurance and amendatory endorsements effecting coverage required by this section. Certificates of Insurance shall provide a minimum 30-day endeavor to notify KCDC of cancellation when available by contractor's insurance. If the contractor receives a non-renewal or cancellation notice from an insurance carrier affording the required coverage, or receives notice that coverage no longer complies with the insurance requirements herein, contractor shall notify KCDC by email or fax within five (5) business days and provide a copy of the non-renewal for cancellation notice or written specifics as to which coverage is no longer in compliance.

The certificate holder address shall read:

Knoxville's Community Development Corporation
Attn: Contracting Officer
N. 901 Broadway
Knoxville, TN 37917

2. Provide certified copies of endorsements and policies if requested by KCDC in lieu of or in addition to Certificates of Insurance.
3. Replace certificates, policies, and endorsements for any such insurance expiring prior to completion of services.
4. Maintain such insurance from the time services commence until services are completed. Failure to maintain or renew coverage or to provide evidence of renewal may be treated by KCDC as a material breach of contract.
5. Require all subcontractors to maintain during the term of the resulting contract commercial general liability insurance, automobile liability insurance, and workers' compensation/employers liability insurance (unless subcontractor's employees are covered by contractor's insurance) in the same manor and limits as specified for the contractor with the exception of the following limits:

General Liability – limits of not less than \$1,000,000 each occurrence. If such insurance contains a general aggregate, it shall apply separately to the work/location for this contract or be no less than \$2,000,000.

Contractor shall furnish subcontractor(s)' Certificates of Insurance to KCDC without expense prior to subcontractor(s) commencing work.

6. 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.
7. Provide a waiver of subrogation for each required policy herein. When required by the insurer, or should a policy condition not permit contractor 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 contractor enter into such an agreement on a pre-loss basis.
8. All policies must be written on an occurrence basis.

- f. Right to Revise or Reject: KCDC reserves the right, but not the obligation, to review or revise any insurance requirement, not limited to limits, coverages and endorsements based on insurance market conditions affecting the availability or affordability of coverage; or changes in the scope of work / specifications affecting the applicability of coverage.
- g. No Representation of Coverage Adequacy: The coverages, limits or endorsements required herein protect the primary interests of KCDC, and the contractor 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 contractor against any loss exposures, whether as a result of the project or otherwise.
- h. Once KCDC sends the successful supplier the notification of intent to award, the supplier is required to provide a Certificate(s) of Insurance evidencing coverage as required above within the timeline detailed noted below. Failure to comply within the set timeframe may constitute unresponsiveness and KCDC reserves the right, at its sole discretion, to reconsider the award.

KCDC has determined the following timeline applies to this solicitation:

General Services:	7 calendar days	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Construction Services	15 calendar days	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

15. **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. 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. Upon the placement of a purchase order or the award of a contract, KCDC will provide a State of Tennessee Sales Tax Exemption form to the supplier. KCDC will not pay taxes on invoices.

16. **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 suppliers as required by the “Supplier’s Licensing Act of 1994” as mandated by the State of Tennessee. The suppliers must have the necessary licensing classifications as required by the Rules of the Tennessee Board for Licensing General Suppliers. 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.

- BC
- BC-A
- BC-B

17. **LIQUIDATED DAMAGES**

Liquidated damages of \$300.00 per calendar day for each day beyond the scheduled completion date apply and are included in the award. However, KCDC will consider explanatory information if it provides a valid reason for delays in schedule.

18. **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.

19. **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 KCDC utilization permits for the work.

20. **QUESTIONS**

Direct questions pertaining to this document to purchasinginfo@KCDC.org with “Five Points Infill Housing Construction Phase 3” in the subject line, at least five days prior to the due date.

21. **REPRESENTATIONS**

By submitting a response, the supplier represents and warrants:

- 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.

22. **RESPONSIBILITIES**

At no expense to KCDC, 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 KCDC, residents, or suppliers.

23. **SAFETY**

- 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.

24. **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 position 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 KCDC 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
3. 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.

25. **SECURITY**

The successful supplier is responsible for providing (if necessary) any and all 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.

26. **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.

27. **STORAGE**

Most KCDC sites have limited storage space for suppliers to access. Suppliers are responsible for the storage of materials and their security. If possible, KCDC will allow suppliers to use space but the safety and security of the items stored is solely the responsibility of the supplier.

28. **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 all aspects of 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 is at the City of Knoxville's Storm Water Engineering Division webpage:
<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 bidder will be required to sign onto the permit and be responsible for implementing and maintaining all erosion control measures as required on the SWPPP.

29. **SUBCONTRACTORS**

Subcontractors must:

- a. Be approved by KCDC prior to beginning work.
- b. Carry the insurance coverages as outlined herein.
- c. Comply with the Davis Bacon requirements and submit certified payrolls.
- d. Not be on HUD's Debarment List.
- e. Not be changed without KCDC's permission.

30. **TIME FOR COMPLETION**

Supplier will complete the project within 14 months from the date of the Notice To Proceed.

31. **WAGE COMPLIANCE (DAVIS BACON REQUIREMENTS)**

- a. Federal Davis Bacon Wage Requirements apply to this work. The successful supplier will:
- Submit certified payrolls showing compliance with the Davis Bacon requirements herein. Failure to do so will be sufficient cause for withholding payment and/or termination of the contract.
 - Must pay its employees at least weekly pursuant to the Davis Bacon determination listed herein.
 - Will display all pages of Wage Posters, in a “prominent spot” at the job site. These are available from the Procurement Division.
 - Will allow KCDC to conduct on-site Davis Bacon interviews of the supplier’s employees. KCDC will use HUD forms and record the information.
 - Classify employees by the applicable Davis Bacon classification. Classifications are determined by the work performed and the tools used-not on titles.
- b. General Decision Information

General Decision Number	TN170023
Date	01-06-2017
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

c. Classifications and rates:

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.		

d. 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:

1. Write a brief letter to KCDC (upon award) stating the title needed and the proposed pay rate. Indicate that the employees agree with the rate and are in agreement with the rate. The rate must bear a reasonable resemblance to other rates on the classification.
2. 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.
3. KCDC will review the request and forward it to HUD and officially request it or KCDC will suggest that the supplier revise the request.
4. HUD will review the request and approve it (or decline it) and send it to the Department of Labor for final approval.
5. The Department of Labor will either approve the request or recommend a different minimum rate.
6. HUD will notify KCDC of the decision.
7. 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.

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

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

32. **WEATHER**

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

a. **EXTENSIONS OF CONTRACT TIME**

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
7.4	7.5	8.1	7.3	7.9	7.1	7.8	6.0	4.8	5.2	7.2	7.9

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, such as excavation, backfill and footings.
 - c. At a rate no greater than one make-up day for each day or consecutive days or rain beyond the Standard Baseline that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the owner.
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 owner 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 and documentation to facilitate evaluation on a basis of calendar month periods, and submit in accordance with the procedures for claims established by the owner.

e. APPROVAL BY OWNER

1. If the extension of the contract time is appropriate, it will occur in accordance with the provisions of this solicitation.
2. Extra costs shall not be incurred by the owner for any extra time increase to the contract.

Scope of Work

SECTION 00 01 15 - LIST OF DRAWING SHEETS

1.01 LIST OF DRAWINGS

- A. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

SHEET NUMBER	SHEET NAME
GENERAL	
A000	COVER SHEET
CIVIL	
C200	OVERALL SITE LAYOUT PLAN
C201	WEST SITE LAYOUT PLAN
C202	NORTHEAST SITE LAYOUT PLAN
C203	SOUTHEAST SITE LAYOUT PLAN
C300	OVERALL SITE GRADING PLAN
C301	WEST SITE GRADING PLAN
C302	NORTHEAST SITE GRADING PLAN
C303	SOUTHEAST SITE GRADING PLAN
C400	OVERALL SITE DRAINAGE PLAN
C401	WEST SITE DRAINAGE PLAN
C402	NORTHEAST SITE DRAINAGE PLAN
C403	SOUTHEAST SITE DRAINAGE PLAN
C404	STORM SEWER PROFILES
C500	OVERALL SITE UTILITY PLAN
C501	WEST SITE UTILITY PLAN
C502	NORTHEAST SITE UTILITY PLAN
C503	SOUTHEAST SITE UTILITY PLAN
C504	SANITARY
C800	DETAILS
C801	DETAILS
C802	DETAILS
C803	DETAILS
C804	DETAILS
C805	DETAILS
C900	INITIAL EROSION PREVENTION AND SEDIMENT CONTROL PLAN
C901	INTERIM EROSION PREVENTION AND SEDIMENT CONTROL PLAN
C902	FINAL EROSION PREVENTION AND SEDIMENT CONTROL PLAN
C90	EROSION CONTROL DETAILS AND NOTES

LANDSCAPE

LA101	OVERALL PLANTING PLAN
LA102	PLANTING PLAN ENLARGEMENT
LA103	PLANTING PLAN ENLARGEMENT
LA104	PLANTING PLAN ENLARGEMENT
LA105	PLANTING PLAN ENLARGEMENT
LA106	PLANTING PLAN ENLARGEMENT
LA107	PLANTING PLAN ENLARGEMENT
LA201	PLANTING DETAILS

ARCHITECTURAL

A010	LIFE SAFETY PLANS
A011	LIFE SAFETY PLANS
A020	ARCHITECTURAL OVERALL SITE PLAN
A021	ARCHITECTURAL SITE PLAN (WEST)
A022	ARCHITECTURAL SITE PLAN (NORTHEAST)
A023	ARCHITECTURAL SITE PLAN (SOUTHEAST)
A030	SITE DETAILS
A050	PARTITION TYPES & STANDARD MOUNTING HEIGHTS
A051	UL DETAILS
A052	UL DETAILS
A053	UL DETAILS
A1-A101	TYPE A1 - BUILDING PLANS & SCHEDULES (COLONIAL REVIVAL)
A1-A102	TYPE A1 - ENLARGED PLANS & INTERIOR ELEVATIONS (COLONIAL REVIVAL)
A1-A301	TYPE A1 - BUILDING ELEVATIONS (COLONIAL REVIVAL)
A1-A302	TYPE A1 - BUILDING SECTIONS (COLONIAL REVIVAL)
A2-A101	TYPE A2 - BUILDING PLANS AND SCHEDULES (VICTORIAN)
A2-A102	TYPE A2 - ENLARGED PLANS & INTERIOR ELEVATIONS (VICTORIAN)
A2-A301	TYPE A2 - BUILDING ELEVATIONS (VICTORIAN)
A2-A302	TYPE A2 - BUILDING SECTIONS (VICTORIAN)
B-A101	TYPE B - FIRST FLOOR PLANS & SCHEDULES (COLONIAL REVIVAL)
B-A102	TYPE B - SECOND FLOOR PLANS, ENLARGED PLANS & INTERIOR ELEVATIONS (COLONIAL REVIVAL)
B-A103	TYPE B - ENLARGED PLANS AND INTERIOR ELEVATIONS (COLONIAL REVIVAL)
B-A301	TYPE B - BUILDING ELEVATIONS (COLONIAL REVIVAL)
B-A302	TYPE B - BUILDING SECTIONS (COLONIAL REVIVAL)
C1-A101	TYPE C1 - BUILDING PLANS AND SCHEDULES (VICTORIAN)
C1-A102	TYPE C1 - ENLARGED PLANS AND INTERIOR ELEVATIONS (VICTORIAN)
C1-A301	TYPE C1 - BUILDING ELEVATIONS (VICTORIAN)
C1-A302	TYPE C1 - BUILDING SECTIONS (VICTORIAN)
C2-A101	TYPE C2 - BUILDING PLANS AND SCHEDULES (ARTS & CRAFTS)
C2-A102	TYPE C2 - ENLARGED PLANS AND INTERIOR ELEVATIONS (ARTS & CRAFTS)
C2-A103	TYPE C2 - ENLARGED PLANS AND INTERIOR ELEVATIONS (ARTS & CRAFTS)
C2-A301	TYPE C2 - BUILDING ELEVATIONS (ARTS & CRAFTS)
C2-A302	TYPE C2 - BUILDING SECTIONS (ARTS & CRAFTS)
D-A101	TYPE D1 & D2 - FIRST FLOOR PLANS AND SCHEDULES (ARTS & CRAFTS)
D-A102	TYPE D1 & D2 - SECOND FLOOR PLANS AND SCHEDULES (ARTS & CRAFTS)
D-A103	TYPE D1 & D2 - ENLARGED PLANS & INTERIOR ELEVATIONS (ARTS & CRAFTS)
D-A104	TYPE D1 & D2 - ENLARGED PLANS AND INTERIOR ELEVATIONS

D-A301	TYPE D1 & D2 - BUILDING ELEVATIONS (ARTS & CRAFTS)
D-A302	TYPE D1 & D2 - BUILDING SECTIONS (ARTS & CRAFTS)
E1-A101	TYPE E1 - BUILDING PLANS AND SCHEDULES (VICTORIAN)
E1-A301	TYPE E1 - BUILDING ELEVATIONS (VICTORIAN)
E1-A302	TYPE E1 - BUILDING SECTIONS (VICTORIAN)
E2-A101	TYPE E2 - BUILDING PLANS AND SCHEDULES (ARTS & CRAFTS)
E2-A301	TYPE E2 - BUILDING ELEVATIONS (ARTS & CRAFTS)
E2-A302	TYPE E2 - BUILDING SECTIONS (ARTS & CRAFTS)
C1-A101M	TYPE C1 MIRRORED - BUILDING PLANS AND SCHEDULES (VICTORIAN)
C1-A102M	TYPE C1 MIRRORED - ENLARGED PLANS AND INTERIOR ELEVATIONS (VICTORIAN)
C1-A103M	TYPE C1 MIRRORED - ENLARGED PLANS AND INTERIOR ELEVATIONS (VICTORIAN)
C1-A301M	TYPE C1 MIRRORED - BUILDING ELEVATIONS (VICTORIAN)
C1-A302M	TYPE C1 MIRRORED - BUILDING SECTIONS (VICTORIAN)
C2-A101M	TYPE C2 MIRRORED - BUILDING PLANS AND SCHEDULES (ARTS & CRAFTS)
C2-A102M	TYPE C2 MIRRORED - ENLARGED PLANS AND INTERIOR ELEVATIONS (ARTS & CRAFTS)
C2-A103M	TYPE C2 MIRRORED - ENLARGED PLANS AND INTERIOR ELEVATIONS (ARTS & CRAFTS)
C2-A301M	TYPE C2 MIRRORED - BUILDING ELEVATIONS (ARTS & CRAFTS)
C2-A302M	TYPE C2 MIRRORED - BUILDING SECTIONS (ARTS & CRAFTS)
E1-A101M	TYPE E1 MIRRORED - BUILDING PLANS AND SCHEDULES (VICTORIAN)
E1-A102M	TYPE E1 MIRRORED - ENLARGED PLANS AND INTERIOR ELEVATIONS (VICTORIAN)
E1-A301M	TYPE E1 MIRRORED - BUILDING ELEVATIONS (VICTORIAN)
E1-A302M	TYPE E1 MIRRORED - BUILDING SECTIONS (VICTORIAN)
401	SECTION DETAILS
A402	SECTION DETAILS
A403	SECTION DETAILS
A501	PLAN DETAILS
A502	ENLARGED STAIR PLANS AND SECTIONS
A503	ENLARGED STAIR PLANS AND SECTIONS
A504	ENLARGED STAIR PLANS, SECTIONS AND DETAILS
A601	CASEWORK DETAILS
A701	DOOR & FRAME ELEVATIONS AND DETAILS
A702	WINDOW ELEVATIONS & DETAILS
STRUCTURAL	
S001	ABBREVIATIONS, SYMBOLS, AND LEGENDS
S002	GENERAL NOTES
S003	TYPICAL DETAILS
S004	TYPICAL DETAILS
A1-S101	FOUNDATION PLAN
A1-S102	SECOND FLOOR FRAMING PLAN
A2-S101	FOUNDATION PLAN
A2-S102	SECOND FLOOR FRAMING PLAN

A2-S103	ROOF FRAMING PLAN
B-S101	FOUNDATION PLAN
B-S102	SECOND FLOOR FRAMING PLAN
B-S103	ROOF FRAMING PLAN
C1-S101	FOUNDATION PLAN & FRAMING PLAN
C2-S101	FOUNDATION & FRAMING PLAN
D1-S101	FOUNDATION PLAN
D1-S102	SECOND FLOOR FRAMING PLAN
D1-S103	ROOF FRAMING PLAN
D2-S101	FOUNDATION PLAN
D2-S102	SECOND FLOOR FRAMING PLAN
D2-S103	ROOF FRAMING PLAN
E1-S101	FOUNDATION & ROOF PLAN
E2-S101	FOUNDATION & ROOF PLAN
S201	SECTIONS & DETAILS
S301	SECTIONS & DETAILS
S401	SECTIONS & DETAILS
S402	SECTIONS & DETAILS

MECHANICAL

M001	MECHANICAL NOTES AND LEGEND
M002	MECHANICAL DETAILS
A1-M101	A1 FIRST AND SECOND FLOOR HVAC PLAN
A2-M101	A2 FIRST AND SECOND FLOOR HVAC PLAN
B-M101	B FIRST AND SECOND FLOOR HVAC PLAN
C1-M101	C1 FIRST AND SECOND FLOOR HVAC PLAN
C2-M101	C2 FIRST AND SECOND FLOOR HVAC PLAN
D1-M101	D1 FIRST AND SECOND FLOOR HVAC PLAN
D2-M101	D2 FIRST AND SECOND FLOOR HVAC PLAN
E1-M101	E1 & E2 FIRST FLOOR HVAC PLAN

PLUMBING

P001	PLUMBING SCHEDULES AND NOTES
P002	PLUMBING DETAILS
A1-P101	TYPE A1 - FIRST AND SECOND FLOOR SANITARY SEWER PLANS
A1-P102	TYPE A1 - FIRST AND SECOND FLOOR DOMESTIC WATER PLANS
A2-P101	TYPE A2 - FIRST AND SECOND FLOOR SANITARY SEWER PLANS
A2-P102	TYPE A2 - FIRST AND SECOND FLOOR DOMESTIC WATER PLANS
B-P101	TYPE B - FIRST AND SECOND FLOOR SANITARY SEWER PLANS
B-P102	TYPE B - FIRST AND SECOND FLOOR DOMESTIC WATER PLANS
C1-P101	TYPE C1 - FIRST AND SECOND FLOOR SANITARY SEWER PLANS
C1-P102	TYPE C1 - FIRST AND SECOND FLOOR DOMESTIC WATER PLANS
C2-P101	TYPE C2 - FIRST AND SECOND FLOOR SANITARY SEWER PLANS
C2-P102	TYPE C2 - FIRST AND SECOND FLOOR DOMESTIC WATER PLANS
D1-P101	TYPE D1 - FIRST AND SECOND FLOOR SANITARY SEWER PLANS
D1-P102	TYPE D1 - FIRST AND SECOND FLOOR DOMESTIC WATER PLANS
D2-P101	TYPE D2 - FIRST AND SECOND FLOOR SANITARY SEWER PLANS
D2-P102	TYPE D2 - FIRST AND SECOND FLOOR DOMESTIC WATER PLANS
E1-P101	TYPE E1 - FIRST FLOOR SANITARY SEWER & DOMESTIC WATER PLANS
E2-P101	TYPE E2 - FIRST FLOOR SANITARY SEWER & DOMESTIC WATER PLANS

FIRE PROTECTION

A1-FP101	TYPE A1 - FIRST AND SECOND FLOOR FIRE PROTECTION PLANS
A2-FP102	TYPE A2 - FIRST AND SECOND FLOOR FIRE PROTECTION PLANS
B-FP101	TYPE B - FIRST AND SECOND FLOOR FIRE PROTECTION PLANS

ELECTRICAL

E001	ELECTRICAL NOTES AND LEGEND
A1-E101	A1 FIRST AND SECOND FLOOR COMPOSITE ELECTRICAL PLAN
A2-E101	A2 FIRST AND SECOND FLOOR COMPOSITE ELECTRICAL PLAN
B-E101	B FIRST FLOOR COMPOSITE ELECTRICAL PLAN
B-E102	B SECOND FLOOR COMPOSITE ELECTRICAL PLAN
C1-E101	C1 ELECTRICAL PLANS
C2-E101	C2 ELECTRICAL PLANS
D1-E101	D1 FIRST AND SECOND FLOOR LIGHTING PLANS
D1-E201	D1 FIRST AND SECOND FLOOR POWER AND COMMUNICATIONS PLANS
D2-E101	D2 FIRST AND SECOND FLOOR LIGHTING PLANS
D2-E201	C2 FIRST AND SECOND FLOOR POWER AND COMMUNICATIONS PLANS
E1-E101	E1 ELECTRICAL PLANS
E2-E101	E2 ELECTRICAL PLANS
ES101	SITE LIGHTING PLAN
ES201	SITE POWER PLAN
ES301	SITE COMMUNICATIONS PLAN

DRAWINGS ARE BOUND WITH PROJECT MANUAL

END OF SECTION 00 01 15

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Project information.
 2. Work covered by Contract Documents.
 3. Work by Owner.
 4. Owner-furnished products.
 5. Access to site.
 6. Work restrictions.
 7. Specification and drawing conventions.
 8. Miscellaneous provisions.

1.2 PROJECT INFORMATION

- A. Project Identification: Five Point – Phase 3.
1. Project Location: 304 S. Kyle Street, Knoxville, TN 37915.
- B. Owner: Knoxville's Community Development Corporation, 901 Broadway, N.E., Knoxville, Tennessee 37917-6699.
1. Owner's Representative: Mr. Orlando Diaz, Partners Development, 501 Union Avenue, Knoxville, Tennessee 37902. Phone: 865-524-7777.
- C. Architect: BarberMcMurry architects, 505 Market Street, Suite 300, Knoxville, TN 37902- 2175. Phone: 865-934-1915. Fax: 865-546-0242.
- D. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
1. Civil: Civil & Environmental Consultants, Inc., 2704 Cherokee Farm Way, Suite 101, Knoxville, TN 37920. Phone: 865.977.9997.
 2. Landscape: CRJA, 524 S. Gay Street, Suite 201, Knoxville, TN 37902. Phone: 865.522.2752.
 3. Structural: Chad Stewart & Associates, Inc., 800 South Gay Street, Suite 1625, Knoxville, TN 37929. Phone: 865.329.9920.
 4. Mechanical, Plumbing, and Electrical: Facility Systems Consultants, LLC, 713 South Central Street, Suite 101, Knoxville, TN 37902. Phone: 865.246.0164.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
1. Construction of 28 Buildings with 80 living units for Phase 3 of Five Points Redevelopment.
 2. Type of Contract: Project will be constructed under a single prime contract.

1.4 WORK BY OWNER

- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
- B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
 - 1. Purchase, delivery and installation of residential appliances.

1.5 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.6 COORDINATION WITH OCCUPANTS

- A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 - 3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.7 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- C. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations.

PART 2 - PRODUCTS (Not Used) PART 3 -

EXECUTION (Not Used) END OF SECTION

01 10 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.

1.2 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.

1.3 ACTION 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 CSI Form 13.1A.
 - 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 revisions 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.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations 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. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. 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.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. 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.
 - m. 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 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, 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.

1.4 QUALITY ASSURANCE

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

1.5 PROCEDURES

- A. Coordination: Revise 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 on discovery of need for change, but not later than 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. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. 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: Not allowed.

PART 3 - EXECUTION (Not Used) END OF

SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used) E

ND OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule for each building.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values for each building to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703.

3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - a. Include separate line items under Contractor and principal subcontracts for sustainable design documentation and other Project closeout requirements.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application for Payment Forms: Use forms acceptable to Architect and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 - 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. Transmittal: Submit five signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Sustainable Design submittal for project materials cost data.
 4. Contractor's construction schedule (preliminary if not final).
 5. Products list (preliminary if not final).
 6. Sustainable Design action plans.
 7. Submittal schedule (preliminary if not final).
 8. List of Contractor's staff assignments.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies.
 13. Performance and payment bonds.
- J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 1. General coordination procedures.
 2. Requests for Information (RFIs).
 3. Project meetings.

1.2 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.

11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. LEED requirements.
 - m. Preparation of record documents.
 - n. Use of the premises and existing building.
 - o. Work restrictions.
 - p. Working hours.
 - q. Owner's occupancy requirements.
 - r. Responsibility for temporary facilities and controls.
 - s. Procedures for moisture and mold control.
 - t. Procedures for disruptions and shutdowns.
 - u. Construction waste management and recycling.
 - v. Parking availability.
 - w. Office, work, and storage areas.
 - x. Equipment deliveries and priorities.
 - y. First aid.
 - z. Security.
 - aa. Progress cleaning.
 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

- C. LEED Coordination Conference: Architect will schedule and conduct a LEED coordination conference before starting construction, at a time convenient to Owner Architect, and Contractor.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent and LEED coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect meeting requirements for LEED certification, including the following:
 - a. LEED Project Checklist.
 - b. General requirements for LEED-related procurement and documentation.
 - c. Project closeout requirements and LEED certification procedures.
 - d. Role of LEED coordinator.
 - e. Construction waste management.
 - f. Construction operations and LEED requirements and restrictions.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- D. Preinstallation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. LEED requirements
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - l. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.
 - v. Installation procedures.
 - w. Coordination with other work.
 - x. Required performance results.

- y. Protection of adjacent work.
 - z. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- E. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for completing LEED documentation.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- F. Progress Meetings: Conduct progress meetings at biweekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule.

Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

- 1) Interface requirements.
- 2) Sequence of operations.
- 3) Status of submittals.
- 4) Status of LEED documentation.
- 5) Deliveries.
- 6) Off-site fabrication.
- 7) Access.
- 8) Site utilization.
- 9) Temporary facilities and controls.
- 10) Progress cleaning.
- 11) Quality and work standards.
- 12) Status of correction of deficient items.
- 13) Field observations.
- 14) Status of RFIs.
- 15) Status of proposal requests.
- 16) Pending changes.
- 17) Status of Change Orders.
- 18) Pending claims and disputes.
- 19) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

G. Coordination Meetings: Conduct Project coordination meetings at biweekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Construction schedule updating reports.
 - 3. Material location reports.
 - 4. Site condition reports.
 - 5. Special reports.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. PDF electronic file.

- B. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
 - 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

- F. Construction Schedule Updating Reports: Submit with Applications for Payment.

- G. Material Location Reports: Submit at monthly intervals.

- H. Site Condition Reports: Submit at time of discovery of differing conditions.

- I. Special Reports: Submit at time of unusual event.

1.4 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including work stages and interim milestones.
 4. Review delivery dates for Owner-furnished products.
 5. Review submittal requirements and procedures.
 6. Review time required for review of submittals and resubmittals.
 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 8. Review time required for Project closeout and Owner startup procedures.
 9. Review and finalize list of construction activities to be included in schedule.
 10. Review procedures for updating schedule.

1.5 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.

4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.

- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - 1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the Work is [14] <Insert number> or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPMSCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource- loaded, time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time- scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
 5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, Sustainable Design documentation, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
 - a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
 - b. Total cost assigned to activities shall equal the total Contract Sum.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.

5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (see special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.

15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.

- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.

- f. Scheduled date for Architect's final release or approval.
- g. Scheduled date of fabrication.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 - 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 - 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- D. Paper Submittals: Not allowed.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS- 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
 5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 1. Post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 3. Action Submittals: Submit one electronic copy of each submittal unless otherwise indicated. Architect will return one copy with comments.
 4. Informational Submittals: Submit one electronic copy of each submittal unless otherwise indicated. Architect will not return copies.
 5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 - b. Three opaque copies of each submittal. Architect will retain two copies; remainder will be returned.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

- b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
- 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - 2. Manufacturer and product name, and model number if applicable.
 - 3. Number and name of room or space.
 - 4. Location within room or space.
 - 5. Submit product schedule in the following format:
 - a. PDF electronic file.
- F. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- G. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

- J. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- K. LEED Submittals: Comply with requirements specified in Section 018113.13 "Sustainable Design Requirements."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.

- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows:
 - 1. "Reviewed": Work may proceed providing it complies with Contract Documents.
 - 2. "Furnish as Noted": Work may proceed providing it complies with notations on submittal and with the Contract Documents.
 - 3. "Revise and Resubmit": Do not proceed with work. Revise submittal in accordance with notations thereon and resubmit to obtain a different action marking. Do not allow submittals with this action marking to be used in connection with performance of the work. In resubmitting, limit corrections to the items marked.
 - 4. "Rejected": Do not proceed with the work. Submittal is rejected for non-compliance with the Contract Documents or other justified cause. Correct the submittal and resubmit to obtain a different action marking. Do not allow submittals with this action marking to be used in connection with the performance of the work.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
 - 2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.

- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor- elected tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 - 3. Owner-performed tests and inspections indicated in the Contract Documents
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and re-inspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, and telephone number of technical representative making report.

2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. **Factory-Authorized Service Representative's Reports:** Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. **Permits, Licenses, and Certificates:** For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. **General:** Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. **Fabricator Qualifications:** A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Demolish and remove mockups when directed unless otherwise indicated.

- L. Integrated Exterior Mockups: Construct integrated exterior mockup. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.9 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
 - 3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. **Retesting/Re-inspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by

testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality- assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.

B. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.

2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.

4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.

6. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association (The) www.aluminum.org	(703) 358-2960
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	American Concrete Institute www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. www.afandpa.org	(205) 257-2530 (202) 463-2700

www.aga.org

AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AHRI	Air-Conditioning, Heating, and Refrigeration Institute, www.ahrinet.or	(703) 524-8800
AI	Asphalt Institute www.asphaltinstitute.or	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.or	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(405) 780-7372
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers	(800) 548-2723

www.asce.org

(703) 295-6300

ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air- Conditioning Engineers (800) 527-4723

ASME	ASME International (American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
ATIS	Alliance for Telecommunications Industry Solutions www.atis.org	(202) 628-6380
AWCMA	American Window Covering Manufacturers Association (Now WCMA)	
AWCI	Association of the Wall and Ceiling Industry www.awci.org	(703) 534-8300
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI, Inc. www.bicsi.org	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772

CCC	Carpet Cushion Council www.carpetcushion.or	(610) 527-3880
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association www.canelect.ca	(613) 230-9263
CEA	Consumer Electronics Association www.ce.org	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CPA	Composite Panel Association www.pbmdf.com	(703) 724-1128
CRI	Carpet and Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175

CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200 (800) 328-6306
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CSA	Canadian Standards Association www.csa.ca	(800) 463-6727 (416) 747-4000
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
ECA	Electrical Components Association www.ec-central.org	(703)907-8024
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee http://content.asce.org/ejcdc/	(703) 295-6000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association (Electrostatic Discharge Association) www.esda.org	(315) 339-6937
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA) www.intertek-etlsemko.com	(800) 967-5352
FIBA	Federation Internationale de Basketball	41 22 545 00 00

	(The International Basketball Federation) www.fiba.com	
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation) www.fivb.ch	41 21 345 35 35
FM Approvals	FM Approvals LLC www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridarroof.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(301) 277-8686
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GRI	(Part of GSI)	
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HI/GAMA	Hydronics Institute/Gas Appliance Manufacturers Association Division of Air-Conditioning, Heating, and Refrigeration Institute (AHRI) www.ahrinet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association	(703) 435-2900

www.hpva.org

HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAPSC	International Association of Professional Security Consultants www.iapsc.or	(515) 282-8192
ICBO	International Conference of Building Officials www.iccsafe.org	(888) 422-7233
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
ICPA	International Cast Polymer Association www.icpa-hq.org	(703) 525-0320
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.or	(212) 419-7900
IES	Illuminating Engineering Society of North America www.iesna.org	(703) 525-0320
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISA	Instrumentation, Systems, and Automation Society, The www.isa.org	(919) 549-8411
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (801) 341-7360
ITS	Intertek Testing Service NA (Now ETL SEMCO)	

ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LGSEA	Light Gauge Steel Engineers Association www.arcat.com	(202) 263-4488
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MCA	Metal Construction Association www.metalconstruction.org	(847) 375-4718
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(888) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now	
MHIA	MHIA) Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937 (604) 298-7578
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591
NACE	NACE International (National Association of Corrosion Engineers International)	(800) 797-6223 (281) 228-6200

	www.nace.org	
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAGWS	National Association for Girls and Women in Sport www.aahperd.org/nagws/	(800) 213-7193, ext. 453
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 222-2300
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NelMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890

NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.org	(901) 526-5016
NOMMA	National Ornamental & Miscellaneous Metals Association www.nomma.org	(888) 516-8585
NRCA	National Roofing Contractors Association www.nrca.net	(800) 272-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NWFA	National Wood Flooring Association www.nwfa.org	(800) 422-4556 (636) 519-9663
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.cee.uiuc.edu	(217) 333-3929
PTI	Post-Tensioning Institute www.post- tensioning.org	(248) 848-3180
RCSC	Research Council on Structural Connections www.boltcouncil.org	

RFCI	Resilient Floor Covering Institute www.rfci.com	(706) 882-3833
RIS	Redwood Inspection Service www.redwoodinspection.com	(925) 935-1499
SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841
SCAQMD	South Coast Air Quality Management District www.aqmd.com	(909) 396-2000
SCTE	Society of Cable Telecommunications Engineers www.scte.org	(800) 542-5040 (610) 363-6888
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoors.com	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(877) 294-5424 (516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SIA	Security Industry Association www.siaonline.org	(866) 817-8888 (703) 683-2075
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611

SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.co	(847) 438-8265
SWI	^m Steel Window Institute www.steelwindows.co	(216) 241-7333
SWPA	^m Submersible Wastewater Pump Association www.swpa.org	(847) 681-1868
TCA	Tilt-Up Concrete Association www.tilt-up.org	(319) 895-6911
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453
TEMA	Tubular Exchanger Manufacturers Association www.tema.org	(914) 332-0040
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.or	(303) 939-9700
TPI	^σ Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrassod.org	(800) 405-8873 (847) 649-5555
TRI	Tile Roofing Institute www.tilerroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USAV	USA Volleyball	(888) 786-5539

	www.usavolleyball.org	(719) 228-6800
USGBC	U.S. Green Building Council www.usgbc.org	(800) 795-1747
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association www.wcmanet.org	(212) 297-2122
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (312) 321-6802
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)	(916) 372-9943

www.wicnet.org

WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7888 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

DIN	Deutsches Institut für Normung e.V. www.din.de	49 30 2601-0
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.or	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

COE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220

EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478

OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Buildings Service (See GSA)	
PHS	Office of Public Health and Science http://www.hhs.gov/ophs/	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USP	U.S. Pharmacopeia www.usp.org	(800) 227-8772
USPS	Postal Service www.usps.com	(202) 268-2000

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
DSCC	Defense Supply Center Columbus (See FS)	

FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil/ Available from Defense Standardization Program www.dsp.dla.mil Available from General Services Administration www.gsa.gov	(215) 697-2664 (202) 619-8925
	Available from National Institute of Building Sciences www.wbdg.org/ccb	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBH	State of California, Department of Consumer Affairs Bureau	(800) 952-5210
F	of Home Furnishings and Thermal Insulation www.dca.ca.gov/bhfti	(916) 574-2041
CCR	California Code of Regulations www.calregs.com	(916) 323-6815
CDH	California Department of Health Services	(916) 445-4171
S	www.dhcs.ca.gov	
CDP	California Department of Public Health, Indoor Air Quality Section	
H	www.cal-iaq.org	

CPU C	California Public Utilities Commission www.cpuc.ca.gov	(415)	703-2782
TFS	Texas Forest Service Forest Resource Development http://txforestsservice.tamu.edu	(979)	458-6606

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire- prevention program.
- D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.

3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air-filtration system discharge.
 4. Waste handling procedures.
 5. Other dust-control measures.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8- inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.
- B. Wood Enclosure Fence: Plywood, 8 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

- D. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10. individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, 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 017700 "Closeout Procedures".

- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Delete "Toilets" Subparagraph below if facilities are unavailable or if their use is not permitted even if available. Indicate location of Owner's existing toilets in Section 011000 "Summary" or show on Drawings.
 - 2. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

- G. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

- H. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
 - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

- I. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

- J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Install lighting for Project identification sign.

- K. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
 - 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine in each field office.
 - 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
 - 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

- C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
 - 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."

- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.

- E. Parking: Provide temporary parking areas for construction personnel.

- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.

- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.

2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touchup signs so they are legible at all times.

H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. 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.

B. 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."

C. 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 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.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas.

2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use permanent HVAC system to control humidity.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.

- b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
- c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 - 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
- b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures." PART

2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

- B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E. Certified Surveys: Submit two copies signed by land surveyor.
- F. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land- surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Comply with requirements specified in other Sections.

- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels.

Level foundations and piers from two or more locations.

- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. 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.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

1.4 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed.

1.5 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Sustainable Design Submittal: Sustainable Design letter template, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
- H. Qualification Data: For waste management coordinator and refrigerant recovery technician.
- I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs an Accredited Professional, certified as waste management coordinator.

- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 1. Review and discuss waste management plan including responsibilities of waste management coordinator.
 2. Review requirements for documenting quantities of each type of waste and its disposition.
 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
1. Total quantity of waste.
 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 3. Total cost of disposal (with no waste management).
 4. Revenue from salvaged materials.
 5. Revenue from recycled materials.
 6. Savings in hauling and tipping fees by donating materials.
 7. Savings in hauling and tipping fees that are avoided.
 8. Handling and transportation costs. Include cost of collection containers for each type of waste.
 9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
1. Comply with operation, termination, and removal requirements in Section 01 50 00 "Temporary Facilities and Controls."
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
1. Distribute waste management plan to everyone concerned within three days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

2. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- D. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- E. Plumbing Fixtures: Separate by type and size.
- F. Lighting Fixtures: Separate lamps by type and protect from breakage.
- G. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch size.
 1. Crush asphaltic concrete paving and screen to comply with requirements in Section 31 20 00 "Earth Moving" for use as general fill.
- B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 1. Pulverize concrete to maximum 1-1/2-inch size.
 2. Crush concrete and screen to comply with requirements in Section 31 20 00 "Earth Moving" for use as satisfactory soil for fill or subbase.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 1. Pulverize masonry to maximum 1-inch size.
 - a. Crush masonry and screen to comply with requirements in Section 31 20 00 "Earth Moving" for use as general fill.
 - b. Crush masonry and screen to comply with requirements in Section 32 93 00 "Plants" for use as mineral mulch.
 2. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
 1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

- J. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- K. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- L. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
 - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 01 74 19

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.

1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
 5. Submit test/adjust/balance records.
 6. Submit sustainable design submittals.
 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
 6. Advise Owner of changeover in heat and other utilities.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
 - 1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 - 1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 - 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:

- a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
4. Submit list of incomplete items in the following format:
- a. Three paper copies. Architect will return two copies.

1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision- obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

- 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
- p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- q. Leave Project clean and ready for occupancy.

- C. Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Operation manuals for systems, subsystems, and equipment.
 - 3. Product maintenance manuals.
 - 4. Systems and equipment maintenance manuals.

1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 1. List of documents.
 2. List of systems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
 1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager.
 7. Name and contact information for Architect.

8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.

- B. Descriptions: Include the following:
 - 1. Product name and model number. Use designations for products indicated on Contract Documents.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.

- C. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.
 - 4. Regulation and control procedures.
 - 5. Instructions on stopping.
 - 6. Normal shutdown instructions.
 - 7. Seasonal and weekend operating instructions.
 - 8. Required sequences for electric or electronic systems.
 - 9. Special operating instructions and procedures.

- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross- reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.

- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.

- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and three sets of prints.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned record prints and three sets of prints.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.

5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.

1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.4 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.01 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.

- f. Special operating instructions and procedures.
- 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Cleanup: Collect used and leftover educational materials and **give to Owner**. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 01 79 00

SECTION 01 81 13 - SUSTAINABLE BUILDING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Summary of sustainable building requirements for project as necessary for certification of this project through the 2015 Criteria.
 - 2. Related performance and administrative requirements.

1.2 REFERENCES

- A. 2015 Enterprise Green Communities Criteria.
- B. 2015 Enterprise Green Communities Multifamily Specifications.
- C. THDA Multifamily Specifications.

1.3 COORDINATION

- A. Contractor is responsible for all requirements of the 2015 Criteria that are contained throughout these Specifications, including successful compliance with and passage of visual inspections and performance tests by verifying party.
- B. Contractor is responsible for all requirements of the Version 3 (Rev. 08) ENERGY STAR Certified Homes National Program Requirements.
- C. ENERGY STAR: Contractor is responsible for coordinating with appropriate verification team members to ensure inspections and leakage tests can be performed at the appropriate times and without delaying construction progress;
 - 1. Coordinate framers, plumbers, HVAC, insulators, and drywall trades to minimize uncontrolled air leakage pathways between residential units by sealing all penetrations in walls, ceilings, and floors in the units and by sealing all vertical chases adjacent to the units.

1.4 SUBMITTALS

- A. Site Improvements
 - 1. 3.1 Environmental Remediation:
 - a. Submit Phase I Environmental Site Assessment, Tier II Environmental Review Assessment, environmental site assessment approved by HUD through the Part 50 or Part 58 process, an environmental assessment approved by USDA through the 1940-G or 1794 process.
 - b. If Environmental Site Assessment reveals hazardous materials submit abatement reports as necessary.

2. 3.2 Erosion and Sedimentation Control:
 - a. Submit photo documentation of erosion control measures throughout construction.
 3. 3.4 Landscaping:
 - a. Submit product data for plantings indicating only native or adaptive species.
- B. Water Conservation
1. 4.1 Water-Conserving Fixtures
 - a. Submit product data for toilets and urinals documenting flush rate in gallons per flush (gpf); for showerheads, kitchen and lavatory faucets, documenting flow rate in gallons per minute (gpm).
 - b. Submit product data for toilets, urinals, showerheads, and lavatory faucets documenting fixture is WaterSense-labeled.
 2. 4.2 Advanced Water Conservation
 - a. Submit product data for toilets and urinals documenting flush rate in gallons per flush (gpf); for showerheads, kitchen and lavatory faucets documenting flow rate in gallons per minute (gpm).
 - b. Submit product data for toilets, urinals, showerheads, and lavatory faucets documenting fixture is WaterSense-labeled.
- C. Energy Efficiency
1. 5.1a Building Performance Standard: New Construction: Multifamily.
 - a. Submit ENERGY STAR New Home certificate for each dwelling unit in the development.
 2. 5.3 Sizing of Heating and Cooling Equipment
 - a. Submit heating and cooling load calculations and equipment selection performed in accordance with the Air Conditioning Contractors of America (ACCA) Manuals J and S or ASHRAE handbooks.
 3. 5.4 ENERGY STAR Appliances
 - a. If providing appliances, submit clothes washer, dishwasher and refrigerator product details generated directly from ENERGY STAR's list of certified products.
 4. 5.5 Lighting
 - a. Submit product data for all lighting fixtures, lighting and lamps documenting efficacy in lumens per watt (lm/W).
 - b. Submit product data for all lighting controls.
 5. 5.6 Electricity Meter
 - a. Submit product data for individual dwelling unit electric meter/submeter.
- D. Materials
1. 6.1 Low / No VOC Paints, Coatings and Primers
 - a. Submit VOC level in grams per liter for all interior paints, coatings, and primers.
 2. 6.2 Low / No VOC Adhesives and Sealants
 - a. Submit VOC level in grams per liter for all interior adhesives, sealants, and caulks.
 3. 6.3 Recycled Content Materials
 - a. Submit product information that identifies post-consumer recycled content and post-industrial recycled content. Eligible products include: Framing: wood, concrete, steel, aluminum, Siding: fiber cement, Flooring, Paving: cement slab (urbanite), Roofing: asphalt shingles, Insulation: fiberglass batt, Sheathing: plywood, OSB.

4. 6.4 Regional Material
 - a. Submit product information that confirms exact location where the material was extracted, processed, and manufactured. Eligible products include:
Framing materials, Exterior materials, Flooring materials, Concrete / cement and aggregate materials, Drywall / interior sheathing materials.
5. 6.6 Composite Wood Products that Emit Low / No Formaldehyde
 - a. Submit product documentation demonstrating that all composite wood products installed within the weather resistive barrier (WRB) are compliant with California 93120 Phase 2.
 - b. If non-compliant products are used, submit photo documentation and confirmation that all exposed edges and sides have been sealed with low- VOC sealants in accordance with Criterion 6.2.
6. 6.7a Environmentally Preferable Flooring
 - a. Submit product documentation to confirm that all hard surface flooring meets the Scientific Certification System's FloorScore program criteria, including for pre-finished hardwood flooring.
 - b. Submit product documentation to confirm all carpet products meet the Carpet and Rug Institute's Green Label Plus certification and all carpet pads and adhesives meet Green Label certification.
7. 6.9 Mold Prevention: Tub & Shower Enclosures
 - a. Submit product documentation demonstrating all drywall behind tub and shower enclosures meets ASTM #D3273.
8. 6.10 Asthmagen-free Materials
 - a. For insulation, submit product documentation demonstrating no formaldehyde in fiberglass batts and no spray polyurethane foam is used.
 - b. For flooring, submit product documentation demonstrating non-flexible vinyl (PVC) roll or sheet flooring was used and that carpets are not backed with vinyl or phthalates.
 - c. For wall coverings, submit product documentation demonstrating flooring materials do not contain vinyl, phthalates, epoxy-based coatings or polyurethane-based coatings.
 - d. For composite wood, submit product documentation demonstrating ULEF or NAF compliance.
9. 6.11 Reduced Heat-Island Effect: Roofing
 - a. Submit: product documentation demonstrating ENERGY STAR-certified roofing product.
10. 6.12 Construction Waste Management
 - a. Refer to 017419 for general information and submittals related to Enterprise Green Communities criterion 6.12 Construction Waste Management.

E. Healthy Living Environment

1. 7.1 Ventilation:
 - a. Submit product data for in-unit ventilation system(s) in compliance with ASHRAE 62.2-2010 requirements for
 - b. local mechanical exhaust system in bathrooms;
 - c. local mechanical exhaust system in kitchens; and
 - d. whole-house mechanical ventilation.

- e. Submit product data for any individual bathroom fans demonstrating ENERGY STAR label and humidistat sensor, timer or other control.
 - f. Submit product data for any central ventilation systems in compliance with ASHRAE 62.1-2010 requirements for any corridors, stair wells, common and amenity areas and retail/commercial/office spaces.
 - g. Submit product data for any central rooftop fans showing direct-drive and variable-speed capability.
 - h. Submit product data for any fan providing central ventilation with design CFM 300-2000 showing an electronically commutated motor (ECM).
2. 7.3 Combustion Safety:
 - a. Submit product data for any combustion water heating or space heating equipment showing compliant venting.
 - b. Submit product data for hard-wired carbon monoxide alarms with battery backup.
 3. 7.5 Vapor Retarder Strategies
 - a. For new or replacement concrete slabs (basements, crawl spaces, and slab on grade construction), submit product data for capillary break and polyethylene sheeting.
 - b. For crawl spaces with no slab, submit product data for polyethylene sheeting.
 4. 7.8 Radon Mitigation
 - a. For all new construction projects in EPA Radon Zone 1, submit photographs of installed radon-resistant construction features: below slab, vent pipe, and adjacent electrical outlet.
 - b. For all substantial rehab projects in EPA Radon Zone 1, submit test results (conducted by a radon professional in accordance with ANSI-AARST MAMF-2012). If test results exceed 4 pCi/L (pico curies per liter), submit photographs of installed radon-reduction measures outlined in ANSI/AARSTR RMS-MF (PS) 2013 or ASTM E 2121-11.
 5. 7.10 Integrated Pest Management
 - a. Submit product data for nontoxic sealing methods including window screens, door sweeps, escutcheon plates, and rodent- and corrosion-proof screens for openings greater than ¼ inch.
 6. 7.12 Active Design: Promoting Physical Activity Within the Building
 - a. Submit photographs of signage located at building entrance and corridor intersections promoting use of stairs over elevator; or photographs of strategies installed to increase frequency and duration of physical activity.
 7. 7.13 Active Design: Staircases and Building Circulation
 - a. Submit product data or photographs demonstrating 10 square feet of glazing in or adjacent to stair doors or magnetic door holds on all doors leading to the stairs.
- F. Operations, Maintenance and Resident Engagement
1. 8.1 Building Operations & Maintenance (O&M) Manual and Plan:
 - a. Submit a manual with thorough building operations and maintenance guidance and a complementary plan, including all of the following components:
 - b. Operations and maintenance guidance for all mechanical, electrical and plumbing equipment and appliances for building-level equipment and dwelling-unit equipment, including HVAC and plumbing as-built information and O&M schedules;

- c. O&M and replacement requirements for any other specialized systems within the project;
 - d. Floor plans specifically highlighting the location of mechanical, electrical, gas, and water-system turnoffs;
 - e. As-built lighting fixture and lamp schedules, specifications, and replacement guidance;
 - f. As-built landscaping and hardscaping plant lists, specifications, maintenance requirements and schedules, and any specific instructions for community gardens or growing spaces;
 - g. As-built irrigation plans, including zone delineation, control sequence, maintenance instructions, seasonal O&M schedule, and indication if irrigation is solely for establishment (indication # years) or is permanent;
 - h. Green cleaning product specifications and cleaning schedules for any finish materials requiring special treatment;
 - i. Pest Control Guidelines that reference the IPM strategies developed in 7.10 Integrated Pest Management;
 - j. Clear O&M requirements for building accessibility systems for residents, including but not limited to security and safety systems, door locking devices such as card keys or other; and
 - k. Maintenance requirements for equipment installed in active recreation and play spaces.
2. 8.2 Emergency Management Manual
- a. Submit information critical to an Emergency Management Manual related to operations such as infrastructure and building shutdown procedures, potable water protection and supply.

PART 2 - PRODUCTS

2.01 PRODUCT REQUIREMENTS

- A. Site Improvements:
 - 1. 3.4 Landscaping:
 - a. All trees, shrubs, groundcover, grasses, and plantings must be native or adapted to the region.
 - b. All new plants must be appropriate to the site's soil and microclimate, and none should be invasive species.
- B. Water Conservation:
 - 1. 4.1 Water-Conserving Fixtures:
 - a. Toilets, WaterSense-labeled and ≤ 1.28 gallons per flush (gpf)
 - b. Urinals, WaterSense-labeled and ≤ 0.5 gpf
 - c. Showerheads, WaterSense-labeled and ≤ 2.0 gallons per minute (gpm)
 - d. Kitchen faucets, ≤ 2.0 gallons per minute (gpm)
 - e. Lavatory faucets, WaterSense-labeled and ≤ 1.5 gallons per minute (gpm)
 - 2. 4.2 Advanced Water Conservation:
 - a. Toilets, WaterSense-labeled and ≤ 1.1 gallons per flush (gpf)
 - b. Showerheads, WaterSense-labeled and ≤ 1.5 gallons per minute (gpm)
 - c. Lavatory faucets, WaterSense-labeled and ≤ 1.0 (gpm)

3. 4.6 Access to Potable Water during Emergencies:
 - a. Install potable water storage tanks capable of providing at least 20 gallons per resident or drilled well with means for pumping water when the electric grid is down.

C. Energy Efficiency:

1. 5.1a Building Performance Standard: New Construction: single family and low-rise multifamily.
 - a. Provide products that meet ENERGY STAR program requirements.
2. 5.3 Sizing of Heating and Cooling Systems
 - a. Install equipment that meets the sizing calculations in accordance with the Air Conditioning Contractors of America (ACCA) Manuals J and S or ASHRAE handbooks. Equipment capacity shall not exceed calculated sizing by more than 20% (unless smaller capacity equipment is unavailable).
3. 5.4 ENERGY STAR Appliances:
 - a. The following appliances shall be ENERGY STAR certified:
 - 1) Clothes washers; and
 - 2) Dishwashers; and
 - 3) Refrigerators.
4. 5.5 Lighting:
 - a. Permanently installed lighting fixtures shall have efficacy ≥ 40 lumens per watt.
 - b. Recessed lights are ballasted compact fluorescent fixtures or use ENERGY STAR qualified LED lamps; and
 - 1) Fixtures are Insulation Contact Air-Tight rated.
 - c. Common area lighting are ballasted compact fluorescent fixtures or use ENERGY STAR qualified LED lamps; and
 - 1) Are controlled by occupancy sensors or automatic bi-level controls
 - d. Exterior lamps are fluorescent or LED; and
 - 1) ENERGY STAR certified when available in the product category; and
 - 2) Dark-Sky approved; and
 - 3) Have motion sensor controls, integrative photo cells, photo sensors or astronomic time-clock operation.
 - e. Exit signs shall consume ≤ 5 watts and have battery backup when located above stairwell doors and other forms of egress.
5. 5.6 Electricity Meter:
 - a. Electric meter or submeter shall be installed that is capable of individually metering each dwelling unit's electricity.

D. Materials:

1. 6.1 Low / No VOC Paints, Coatings and Primers:
 - a. All interior paints and primers must have volatile organic compound (VOC) levels, in grams per liter, less than or equal to the thresholds established by South Coast Air Quality Management District (SCAQMD) Rule 1113. Projects must follow the most recent revision available at the time of product specification. For the latest rules: www.aqmd.gov/home/regulations/rules; as of July 1, 2013 SCAQMD Rule 1113 thresholds are listed as:
 - b. Primers and sealers: 100g/L
 - c. Coatings, flats and non-flats: 50 g/L
 - d. Opaque floor coatings: 50 g/L

- e. Rust preventative coatings: 100 g/L
 - f. Clear wood finishes: 275 g/L
2. 6.2 Low / No VOC Adhesives and Sealants:
- a. All interior adhesives and sealants (including caulks) must have volatile organic compound (VOC) levels, in grams per liter, less than or equal to the thresholds established by South Coast Air Quality Management District (SCAQMD) Rule 1168. Projects must follow the most recent revision available at the time of product specification. For the latest rules: www.aqmd.gov/home/regulations/rules; as of January 7, 2005, SCAQMD Rule 1168 thresholds are listed as:
 - 1) Indoor carpet adhesives: 50 g/L
 - 2) Carpet pad adhesives: 50 g/L
 - 3) Outdoor carpet adhesives: 150 g/L
 - 4) Wood flooring adhesives: 100 g/L
 - 5) Rubber floor adhesives: 60 g/L
 - 6) Subfloor adhesive: 50 g/L
 - 7) Ceramic tile adhesives: 65 g/L
 - 8) VCT and asphalt tile adhesives: 50 g/L
 - 9) Drywall and panel adhesives: 50 g/L
 - 10) Cove base adhesives: 50 g/L
 - 11) Multipurpose construction adhesives: 100 g/L
 - 12) Structural glazing adhesives: 100 g/L
 - 13) Single-ply roof membrane adhesives: 250 g/L
 - 14) Structural wood member adhesive: 140 g/L
 - 15) Architectural sealants, including caulk: 250 g/L
3. 6.3 Recycled Content Materials:
- a. Use building materials that feature recycled content. The building material must make up 75% (by weight or cost) of a project component, and must be composed of at least 25% post-consumer recycled content or at least 50% post-industrial recycled content. Eligible products include: Framing: wood, concrete, steel, aluminum, Siding: fiber cement, Flooring, Paving: cement slab (urbanite)], Roofing: asphalt shingles, Insulation: fiberglass batt, Sheathing: plywood, OSB.
4. 6.4 Regional Material:
- a. Use products that were extracted, processed, and manufactured within 500 miles of the project for a minimum of 50%, based on cost, of the building materials' value. Building material types that can qualify include: Framing materials, Exterior materials (e.g. siding, masonry, roofing), Flooring materials, Concrete/cement and aggregate material, Drywall/interior sheathing materials.
5. 6.6 Composite Wood Products that Emit Low / No Formaldehyde
- a. All composite wood products (plywood, OSB, MDF, cabinetry, etc.) installed within the weather-resistive barrier (WRB) must either be certified as compliant with California 93120 Phase 2, and/or;
 - b. For composite wood products installed within the WRB that do not comply with California 93120 Phase 2, all exposed edges and sides must be sealed with low-VOC sealants per Criterion 6.2.
6. 6.7a Environmentally Preferable Flooring
- a. All hard surface flooring must be a product that meets the Scientific Certification System's FloorScore program criteria, including for pre-finished hardwood flooring.

- b. All carpet products must meet the Carpet and Rug Institute's Green Label Plus certification and all carpet pads and adhesives must meet Green Label certification.
- 7. 6.7b Environmentally Preferable Flooring Throughout
 - a. Use only non-vinyl, non-carpet floor coverings throughout the building.
- 8. 6.9 Mold Prevention: Tub & Shower Enclosures:
 - a. Use moisture-resistant backing materials such as cement board, fiber cement board, or equivalent per ASTM #D3273 behind tub/shower enclosures.
- 9. 6.10 Asthmagen-free Materials
 - a. For insulation, do not use spray polyurethane foam (SPF) or formaldehyde-containing fiberglass batts.
 - b. For flooring, do not use flexible vinyl (PVC) roll or sheet flooring or carpet backed with vinyl or phthalates. Do not use fluid applied finish floor.
 - c. For wall coverings, do not use wallpaper made from vinyl (PVC) with phthalates or site-applied high-performance coatings that are epoxy-based or polyurethane-based.
 - d. For composite wood, use only Ultra Low Emitting Formaldehyde (ULEF) or No Added Formaldehyde (NAF) products for cabinetry, subflooring, and other interior composite wood uses.
- 10. 6.11 Reduced Heat-Island Effect: Roofing
 - a. Use an ENERGY STAR-certified product for 100% of the non-vegetated roof area.
 - b. Use an intensive or extensive vegetated roof system with waterproof layer, drainage layer, growing medium and containment with appropriate planting and irrigation for the vegetated portion of the roof area.

E. Healthy Living Environment

- 1. 7.1 Ventilation
 - a. In-unit ventilation system(s) shall comply with ASHRAE 62.2-2010 requirements for local mechanical exhaust system in bathrooms and kitchens, and whole-house mechanical ventilation. Design/measured flow rates shall not exceed ASHRAE 62.2-2010 requirements by more than 50%.
 - b. Individual bathroom fans shall be
 - 1) ENERGY STAR labeled; and either
 - c. turn on with the light switch and off with associated automatic delay timer, or
 - d. be activated by motion sensor, humidistat or other appropriate control.
 - e. Central ventilation system (s) shall comply with ASHRAE 62.1-2010 requirements for any corridors, stair wells, common and amenity areas and retail/commercial/office spaces. Design/measured flow rates shall not exceed ASHRAE 62.1-2010 requirements by more than 50%.
 - f. Any central rooftop fans shall be direct-drive and variable-speed.
 - g. Any fan providing central ventilation with design CFM 300-2000 shall be equipped with an ECM motor.
- 2. 7.3 Combustion Safety
 - a. Any combustion water heating or space heating equipment located within the conditioned envelope shall be power-vented or direct-vented.
 - b. Carbon monoxide alarms shall be hard-wired with battery backup.
- 3. 7.5 Vapor Retarder Strategies

- a. Polyethylene sheeting used as a vapor retarder beneath any new or replacement concrete slabs (including basements, crawl spaces, or slab on grade construction) shall be at least 10mm thick.
- b. Polyethylene sheeting used as a vapor retarder in crawl spaces (with no concrete slab) shall be at least 8mm thick.
- 4. 7.7 Mold Prevention: Water Heaters
 - a. Drain pans under tank water heaters shall be sloped and corrosion-resistant (e.g., stainless steel or plastic).
- 5. 7.10 Integrated Pest Management
 - a. Sealants shall be low-VOC.
 - b. Openings greater than ¼" shall be equipped with rodent- and corrosion-proof screens.
 - c. Operable windows shall have screens.
 - d. All exterior doors and apartment entry doors shall be equipped with weatherstripping and door sweeps.
- 6. 7.13 Active Design: Staircases and Building Circulation
 - a. All stairwell doors shall incorporate 10 square feet of glazing in door or side light or be equipped with magnetic door holds.

PART 3 - EXECUTION

3.1 ENTERPRISE GREEN COMMUNITIES – GENERAL

- A. Meet all Mandatory criterion and all Optional criterion as identified and specified by the design team, as required to achieve certification through Enterprise Green Communities.

3.2 EXECUTION REQUIREMENTS

A. Site Improvements

- 1. 3.1 Environmental Remediation:
 - a. Execute mitigation steps as determined by environmental assessment.
- 2. 3.2 Erosion and Sedimentation Control:
 - a. Follow all Best Management Practices (BMPs) within the Total Erosion and Sedimentation Control (TESC) Plan.
 - b. Photograph all erosion control measures used throughout construction, including representative photos during rain events (as applicable) to document no visible off-site discharge.
- 3. 3.4 Landscaping:
 - a. Any disturbed area must be reseeded or xeriscaped with plants that meet product requirements.

B. Energy Efficiency:

- 1. 5.1a Building Performance Standard: New Construction: single family and low-rise multifamily:
 - a. Certify each dwelling unit under ENERGY STAR Certified Homes program; and meet all Program Requirements of the applicable program.
 - b. Co-ordinate with a qualified third-party Energy Rater to field verify compliance with all requirements of the applicable program.

2. 5.3 Sizing of Heating and Cooling Equipment
 - a. Use HVAC load calculation software programs reviewed by ACCA to perform Manual J and S calculations; and
 - b. Select and install HVAC equipment according to ACCA Manual J and S procedures to ensure right-sizing.

- C. Materials:
 1. 6.6 Composite Wood Products that Emit Low/No Formaldehyde
 - a. For composite wood products installed within the WRB, that do not comply with California 93120 Phase 2, all exposed edges and sides must be sealed with low-VOC sealants per Criterion 6.2 prior to installation.

- D. Healthy Living Environment:
 1. 7.1 Ventilation:
 - a. Install the following ventilation systems and ductwork in full accordance with ASHRAE 62.2-2010 and manufacturer's recommendations (This includes following guidelines for minimum straight duct length from fan boxes prior to first bend, type and size of duct, and number of bends to exterior wall termination):
 - b. Local mechanical exhaust system in each bathroom and wire individual bathroom fans to turn on with light switch;
 - c. Local mechanical exhaust system in each kitchen;
 - d. Whole-house ventilation system.
 - e. In the common spaces and hallways of multifamily buildings 4 stories or taller, install mechanical ventilation systems in full accordance with ASHRAE 62.1-2010 and manufacturer's recommendations.
 2. 7.2 Clothes Dryer Exhaust:
 - a. Install rigid-type exhaust ductwork to connect all vented clothes dryers directly to outdoors.
 - b. Install a plumbed drain for all condensing or heat pump clothes dryers.
 3. 7.3 Combustion Safety:
 - a. Install hard-wired carbon monoxide (CO) alarm with battery backup function for each sleeping zone and placed per National Fire Protection Association (NFPA) 720.
 - b. For rehab projects with any atmospheric combustion space or water heating equipment within the conditioned envelope, conduct combustion safety testing for minimum 10% of dwelling units in accordance with RESNET or BPI Combustion Safety Test Procedures. Report any deficiencies immediately to the owner or owner's representative.
 4. 7.5 Vapor Retarder Strategies:
 - a. Install products in accordance with ENERGY STAR program requirements.
 - b. For projects with new concrete slab (for basements, crawl spaces, or slab on grade construction), install a capillary break as follows:
 - c. Install 4-inch layer of half-inch diameter or greater clean aggregate, or a 4- inch uniform layer of sand, overlain with a layer or strips of geotextile drainage matting installed according to the manufacturer's instructions.
 - d. Immediately above the aggregate/sand capillary break, install 10 mil (or thicker) polyethylene sheeting, overlapped 6 inches (or greater) at the seams, in direct contact with the concrete slab above.

- e. For projects with crawl spaces that have no concrete slab, install a vapor retarder as follows:
 - f. Install 8 mm minimum thickness cross-laminated polyethylene on the crawl floor, extended at least 12 inches upward on piers and foundation walls, and overlap joints at least 12 inches minimum.
 - g. Line “high-traffic” areas of the crawl space with foam board to avoid disturbing polyethylene.
5. 7.6 Water Drainage:
- a. Install waterproofing and water management systems to direct water away from walls, windows, doors, and roofs.
 - b. Provide a continuous weather resistive barrier and drainage plane in accordance with manufacturer’s instructions:
 - 1) Install housewrap with sheets lapped single-style to prevent bulk water from penetrating the building cavity.
 - c. Provide a means for bulk water to drain out from beneath cladding, i.e. weep holes.
 - d. Install flashing at all roof/wall intersections and wall penetrations that is integrated with the weather-resistive barrier and drainage plane. Penetrations to be flashed include any plumbing, electrical, vent, and HVAC refrigerant line penetrations. Provide pan, side, and head flashings for any openings.
 - e. Install drip edge at entire perimeter of roof.
 - f. At wall/roof intersections, maintain minimum 2-inch clearance between wall cladding and roofing materials, fully flash the intersection, and install kick- out flashing.
6. 7.7 Mold Prevention: Water Heaters:
- a. Install non-water-sensitive floor coverings in rooms with water heaters.
 - b. Install plumbed floor drains or plumbed drain pans under all tank water heaters, and ensure that floor slope or drain pan slope allows for adequate drainage.
 - c. Direct all condensate lines into a plumbing system; do not deposit condensate under concrete slabs.
7. 7.8 Radon Mitigation:
- a. For all new construction projects in EPA Radon Zone 1, install passive radon-resistant construction features as follows:
 - 1) Seal the foundation with polyurethane caulk or the equivalent at all slab openings, penetrations, and control or expansion joints and sump covers.
 - 2) Install below-slab venting and a vertical vent pipe that extends to daylight above the roofline.
 - 3) Install a junction box and electrical outlet within 10’ of the vent pipe termination to allow for future conversion to an active radon reduction system.
 - b. For all substantial rehab projects in EPA Radon Zone 1, conduct a test for radon by a radon professional in accordance with ANSI-AARST MAMF- 2012). If test results exceed 4 pCi/L (pico curies per liter), install radon- reduction measures outlined in ANSI/AARSTR RMS-MF (PS) 2013 or ASTM E 2121-11.

8. 7.10 Integrated Pest Management
 - a. Seal all interior and exterior wall, floor, and joint penetrations with low-VOC caulking or other appropriate nontoxic sealing method (window screens, door sweeps, escutcheon plates, elastomeric sealant) to prevent pest entry.
 - b. Install rodent- and corrosion-proof screens (copper or stainless steel mesh, or rigid metal cloth) for openings greater than ¼ inch.
 - c. Thoroughly seal entry points under kitchen and bathroom sinks to prevent pest entry.

E. Operations and Maintenance:

1. 8.4 Resident and Property Staff Orientation:
 - a. Use materials provided under Criterion 8.1 and 8.2 to deliver training to facility management and building maintenance staff on all relevant systems.

END OF SECTION 01 81 13

SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

1.2 DEFINITIONS

- A. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- C. CxA: Commissioning Authority.
- D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.3 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Owner:
 - 1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
 - 2. Representatives of the facility user and operation and maintenance personnel.
 - 3. Architect and engineering design professionals.

1.4 OWNER'S RESPONSIBILITIES

- A. Provide the OPR documentation to the CxA and Contractor for information and use.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
- C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.5 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 - 1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - 2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
 - 3. Attend commissioning team meetings held on a biweekly basis.
 - 4. Integrate and coordinate commissioning process activities with construction schedule.
 - 5. Review and accept construction checklists provided by the CxA.
 - 6. Complete electronic construction checklists as Work is completed and provide to the Commissioning Authority on a weekly basis.
 - 7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
 - 8. Complete commissioning process test procedures.

1.6 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Provide commissioning plan.
- C. Convene commissioning team meetings.
- D. Provide Project-specific construction checklists and commissioning process test procedures.
- E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.
- F. Prepare and maintain the Issues Log.
- G. Prepare and maintain completed construction checklist log.

- H. Witness systems, assemblies, equipment, and component startup.
- I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 91 13

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Slabs-on-grade.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
 - 1. Product Data for Low VOC Content: For curing and sealing compounds, documentation including printed statement of VOC content.
 - 2. Design Mixtures for Recycled Content Credit: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements, and for equivalent concrete mixtures that do not contain portland cement replacements.
- C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

- E. Samples: For vapor retarder.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.

- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Curing compounds.
 - 7. Bonding agents.
 - 8. Adhesives.
 - 9. Vapor retarders.
 - 10. Semirigid joint filler.
 - 11. Joint-filler strips.
 - 12. Repair materials.

- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates.

- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

- F. Field quality-control reports.

- G. Minutes of pre-installation conference.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI- certified Concrete Flatwork Technician.

- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, vapor-retarder installation, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.
- D. Deformed-Steel Wire: ASTM A 496/A 496M.
- E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- F. Anchor Bolts: Conform to ASTM F1554 Grade 36 unless otherwise indicated on drawings. Nuts shall conform to ASTM A563, hex nuts.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

2.4 For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.

- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A or B (10 MIL minimum thickness) Include manufacturer's recommended adhesive or pressure-sensitive tape.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
 - b. Fortifiber Building Systems Group; Moistop Ultra 10.
 - c. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
 - d. Insulation Solutions, Inc.; Viper VaporCheck 10.
 - e. Meadows, W. R., Inc.; Perminator 10mil.
 - f. Raven Industries Inc.; Vapor Block 10.
 - g. Reef Industries, Inc.; Griffolyn 10 mil Green.
 - h. Stego Industries, LLC; Stego Wrap 10 mil Class A.

2.7 CURING MATERIALS

- A. Evaporation Retarder for areas scheduled to receive floor covering: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
 - b. BASF Construction Chemicals - Building Systems; Confilm.
 - c. ChemMasters; SprayFilm.
 - d. Conspec by Dayton Superior; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film (J-74).
 - f. Edoco by Dayton Superior; BurkeFilm.
 - g. Euclid Chemical Company (The), an RPM company; Eucobar.
 - h. Kaufman Products, Inc.; Vapor-Aid.
 - i. Lambert Corporation; LAMBCO Skin.
 - j. L&M Construction Chemicals, Inc.; E-CON.
 - k. Meadows, W. R., Inc.; EVAPRE.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group; MONOFILM.
 - n. Sika Corporation; SikaFilm.
 - o. SpecChem, LLC; Spec Film.
 - p. Symons by Dayton Superior; Finishing Aid.
 - q. TK Products, Division of Sierra Corporation; TK-2120TRI-FILM.
 - r. Unitex; PRO-FILM.
 - s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

- B. Clear, Waterborne, Membrane-Forming Dissipating Curing Compound: ASTM C309, Type 1, Class B, dissipating.
 - 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. Euclid Chemical Company: Kurex DR VOX
 - b. L & M Construction Materials, Inc.: L & M Cure R
 - c. Nox-Crete Products Group: Bro-Cure
 - d. Spec Chem - SpecRez

- C. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A. – Only seal concrete where no flooring materials will be applied or where specifically required on construction documents.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals - Building Systems; Kure 1315.
 - b. ChemMasters; Polyseal WB.
 - c. Conspec by Dayton Superior; Sealcure 1315 WB.
 - d. Edoco by Dayton Superior; Cureseal 1315 WB.
 - e. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300.
 - f. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
 - g. Lambert Corporation; UV Safe Seal.
 - h. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
 - i. Meadows, W. R., Inc.; Vocomp-30.
 - j. Metalcrete Industries; Metcure 30.
 - k. Right Pointe; Right Sheen WB30.
 - l. Symons by Dayton Superior; Cure & Seal 31 Percent E.
 - m. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.
 - n. SpecChem E-Cure – Compatible with most Flooring compounds
 - 2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

- C. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
 - 1. Granular fill below slab-on-grade (slab sub-base) shall consist of a densely graded, compactable “crusher run” material per ASTM D1241. This material should have a uniform distribution of particle sizes ranging from 100 percent passing a 1-1/2” sieve down to 0 – 10% passing a No. 100 sieve. If crusher run material is not available, compact open graded granular fill (#57) and choke off with ½” – 1” of Fine-Graded Granular Material (#10 aggregate per ASTM D448) as listed below for slab sub-base.

- D. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5- mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash, as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing or high-range water-reducing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.50.
 3. Slump Limit: 5 inches, plus or minus 1.5 inches.
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.50.
 3. Minimum Cementitious Materials Content: 470 lb/CY for interior slabs
 4. Minimum Cementitious Materials Content: 520 LB/CY for exterior slabs
 5. Maximum Aggregate Size: 1 ½"
 6. If Fly-Ash is added into slabs-on-grade mix, the addition shall not be less than 15% nor more than 20% of cementitious materials.
 7. Slump Limit: 4, plus or minus 1 inch.
 8. Air Content for Exterior Slabs-on-Grade: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 9. Air Content for Interior Slabs-on-Grade: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
 2. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1- 1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 3. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).

4. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for slabs and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
 - 2. Install under all interior slab areas indicated to receive any type of floor covering.
 - 3. Seal all joints and penetrations per manufacturer's instructions.
 - 4. Terminate the vapor retarder per manufacturer's instructions.
 - 5. Extend Vapor Barrier to outside edge of thickened slab edge and turn up 6", min.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
 1. For slabs-on-grade, provide 2" chairs on a 3'-0" x 3'-0" grid to fully support welded wire fabric at all locations.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 3. Locate joints for slabs in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls at underside of floors and slabs and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 7. Install slab-on-grade construction joints in a similar pattern to contraction joints as designated on construction documents.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
 3. Install contraction joints as designated on construction documents.
- D. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces to receive a rubbed finish.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where exposed to view:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floorcoverings.
 - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

- C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
 - 2. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4- inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
6. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.

4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory- cured specimens at 7 days and one set of two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28- day tests.
 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 03 30 00

SECTION 03 54 13 - GYPSUM CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes gypsum-cement-based, self-leveling underlayment over existing wood floors for application below interior floor coverings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
 - 1. For priming and sealing coatings, documentation including printed statement of VOC content.
 - 2. For priming and sealing coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.
- B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.
- C. Preinstallation Conference: Conduct conference at Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
 - 1. Place gypsum-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

1.6 COORDINATION

- A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, to ensure compatibility of products.

PART 2 - PRODUCTS

2.01 GYPSUM-CEMENT-BASED UNDERLAYMENTS

- A. Underlayment: Gypsum-cement-based, self-leveling product that can be applied in minimum uniform thickness of 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Allied Custom Gypsum; AccuCrete.
 - b. Ardex; GS-4 Self-Leveling Repair Underlayment
 - c. Bonsal American, an Oldcastle company; ProSpec Level Set G.
 - d. CMP Specialty Products, Inc.; Level Finish G-SL.
 - e. Conspec by Dayton Superior; Conflow Supreme.
 - f. Euclid Chemical Company (The); Flo-Top.
 - g. Maxxon Corporation; Gyp-Crete.
 - h. USG Corporation; Levelrock 2500.
 - 2. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C 219.
 - 3. Compressive Strength: Not less than 2000 psi at 28 days when tested according to ASTM C 109/C 109M.
 - 4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.
- B. Water: Potable and at a temperature of not more than 70 deg F.
- C. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.
- D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
 - 1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.
 - 2. Primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance.
 - 1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
 - 1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 - 2. Fill substrate voids to prevent underlayment from leaking.
- B. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.
 - 1. Install underlayment reinforcement recommended in writing by manufacturer.
- C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
 - 1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
 - 2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
 - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- B. Apply underlayment to produce uniform, level surface.
 - 1. Feather edges to match adjacent floor elevations.
- C. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- D. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- E. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03 54 13

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Face brick.
 - 2. Building (common) brick.
 - 3. Mortar and grout.
 - 4. Steel reinforcing bars.
 - 5. Masonry joint reinforcement.
 - 6. Ties and anchors.
 - 7. Embedded flashing.
 - 8. Miscellaneous masonry accessories.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
 - 1. For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
- C. Samples for Initial Selection:
 - 1. Face brick, in the form of straps of five or more bricks.
 - 2. Colored mortar.
 - 3. Weep holes/vents.
- D. Samples for Verification: For each type and color of the following:
 - 1. Face brick.
 - 2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 - 3. Weep holes and vents.
 - 4. Accessories embedded in masonry.

1.4 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
 - d. For surface-coated brick, include test report for durability of surface appearance after 50 cycles of freezing and thawing per ASTM C 67 or a list of addresses of buildings in Project's area where proposed brick has been used successfully and with a history of durability.
 - e. For masonry units, include data and calculations establishing average net- area compressive strength of units.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS602.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Sample Panels: Build not less than three sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.
 - 1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches long by 36 inches high by full thickness.
 - 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
 - 3. Clean exposed faces of panels with masonry cleaner indicated.
 - 4. Protect approved sample panels from the elements with weather-resistant membrane.
 - 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Build mockups for typical exterior wall in sizes approximately 96 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
 - b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
 - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include wood studs, sheathing, building wrap, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry- veneer wall mockup.

3. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
 4. Clean exposed faces of mockups with masonry cleaner as indicated.
 5. Protect accepted mockups from the elements with weather-resistant membrane.
 6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
 7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.

2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
 - C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
 - D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
 - E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.2 BRICK

- A. Regional Materials: Brick shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- C. Face Brick: Facing brick complying with ASTM C 216 or hollow brick complying with ASTM C 652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).
1. Products: Subject to compliance with requirements, provide one of the following as directed by the Architect. Provide all brick from the same manufacturer as directed by the Architect.
 - a. Face Brick: As selected by Architect.
 2. Grade: SW.
 3. Type: FBS.
 4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
 5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 6. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet or shall have a history of successful use in Project's area.
 7. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
 8. Application: Use where brick is exposed unless otherwise indicated.
 9. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
 10. Provide solid units match face brick where cores would be exposed.
 11. Color and Texture: As selected by Architect.
- D. Building (Common) Brick: ASTM C 62, Grade SW.
1. Size: Match size of face brick.
 2. Application: Use where brick is indicated for concealed locations.

2.3 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: ASTM C 91.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Capital Materials Corporation; Flamingo Color Masonry Cement.
 - b. Cemex S.A.B. de C.V.; Brikset Type N.
 - c. Essroc, Italcementi Group; Brixment.
 - d. Holcim (US) Inc.; Rainbow Mortamix.
 - e. Lafarge North America Inc.; Magnolia Masonry Cement.
 - f. Lehigh Cement Company; Lehigh Masonry Cement.
 - g. National Cement Company, Inc.; Coosa Masonry Cement.
- F. Colored Cement Product: Packaged blend made from portland cement and hydrated lime or masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Colored Portland Cement-Lime Mix:
 - 1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
 - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
 - 3) Lafarge North America Inc.; Eaglebond Portland & Lime.
 - 4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
 - b. Colored Masonry Cement:
 - 1) Capital Materials Corporation; Flamingo Color Masonry Cement.
 - 2) Cemex S.A.B. de C.V.; Richcolor Masonry Cement.
 - 3) Essroc, Italcementi Group; Brixment-in-Color.
 - 4) Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
 - 5) Lafarge North America Inc.; U.S. Cement Custom Color Masonry Cement.
 - 6) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.
 - 7) National Cement Company, Inc.; Coosa Masonry Cement.
 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 3. Pigments shall not exceed 10 percent of portland cement by weight.
 4. Pigments shall not exceed 5 percent of masonry cement by weight.
- G. Aggregate for Mortar: ASTM C 144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand.
 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The); Accelguard 80.

- b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
- c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ACM Chemistries; RainBloc for Mortar.
 - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
 - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

J. Water: Potable.

2.4 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

- 1. Interior Walls: Hot-dip galvanized, carbon steel.
- 2. Exterior Walls: Hot-dip galvanized, carbon steel.
- 3. Wire Size for Side Rods: 0.187-inch diameter.
- 4. Wire Size for Cross Rods: 0.187-inch diameter.
- 5. Wire Size for Veneer Ties: 0.187-inch diameter.
- 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
- 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Multiwythe Masonry:

- 1. Adjustable (two-piece) type, ladder design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

2.5 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

- 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
- 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
- 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

- 1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch-thick, steel sheet, galvanized after fabrication.

2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch-diameter, hot-dip galvanized steel wire.
3. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M

C. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05-inch.
2. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors:
3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section long enough to accommodate continuous insulation.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Dayton Superior Corporation, Dur-O-Wal Division; D/A 213.
 - 2) Hohmann & Barnard, Inc.; 2-Seal Thermal Wing Nut Anchor.
 - 3) Wire-Bond; RJ-711.
 - b. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick, steel sheet, galvanized after fabrication.
 - c. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch-diameter, hot-dip galvanized steel wire.
 - d. Provide manufacturer's recommended fasteners for wood framing.

2.6 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

B. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: 3-oz./sq. ft. copper sheet bonded between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Advanced Building Products Inc.; Copper Fabric Flashing.
 - 2) Dayton Superior Corporation, Dur-O-Wal Division; Copper Fabric Thru-Wall Flashing.
 - 3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
 - 4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
 - 5) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
 - 6) York Manufacturing, Inc.; Multi-Flash 300.

- C. Application: Unless otherwise indicated, use the following:
 1. Where flashing is partly exposed and is indicated to terminate at the wall face, flexible flashing with a metal drip edge.
 2. Where flashing is fully concealed, use flexible flashing.
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- E. Termination Bars: 26-gauge by 1-1/2-inches by 8 feet long type 304 stainless steel with 1/4 inch diameter holes spaced 8 inches on center.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Use one of the following unless otherwise indicated:
 1. Wicking Material for window sills: Absorbent rope, made from cotton, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity. Use only for weeps.
 2. Cellular Plastic Weep/Vent for all other locations: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Advanced Building Products Inc.; Mortar Maze weep vent.
 - 2) Blok-Lok Limited; Cell-Vent.
 - 3) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
 - 4) Heckmann Building Products Inc.; No. 85 Cell Vent.
 - 5) Hohmann & Barnard, Inc.; Quadro-Vent.
 - 6) Wire-Bond; Cell Vent.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Advanced Building Products Inc.; Mortar Break II.
 - b. Archovations, Inc.; CavClear Masonry Mat.
 - c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
 - d. Mortar Net USA, Ltd.; Mortar Net.

2. Provide one of the following configurations:
 - a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.
 - b. Strips, not less than 1-1/2 inches thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
 - c. Sheets or strips full depth of cavity and installed to full height of cavity.
 - d. Sheets or strips not less than 1 inch thick and installed to full height of cavity with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.

2.8 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
 2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Pigmented Mortar: Use colored cement product.
 1. Pigments shall not exceed 10 percent of portland cement by weight.
 2. Pigments shall not exceed 5 percent of masonry cement by weight.
 3. Mix to match Architect's sample.
 4. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Face brick.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
 1. Mix to match Architect's sample.
 2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:

- a. Face brick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2-inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2-inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and CMU as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 - 1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 - 1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement to allow for differential movement regardless of whether bed joints align.
 - 2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

3.7 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.8 ANCHORING MASONRY TO CONCRETE

- A. Anchor masonry to concrete where masonry abuts or faces concrete to comply with the following:
 - 1. Provide an open space not less than ½-inch wide between masonry and concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.

3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24- inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.10 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 2. Install preformed control-joint gaskets designed to fit standard sash block.
 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick as follows:
 1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and attach to inner wythe with a termination bar and fasteners spaced 8 inches on center.

3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; and attach to sheathing with metal termination bar and fasteners spaced 8 inches on center.
 4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
- C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
1. Use specified weep/vent products or open head joints to form weep holes.
 2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 3. Space weep holes 24 inches o.c. unless otherwise indicated.
 4. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
 5. Trim wicking material flush with outside face of wall after mortar has set.
- D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

3.12 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.

3.13 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.14 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.15 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Projects site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
1. Crush masonry waste to less than 4 inches in each dimension.
 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 2. Steel pipe columns for supporting wood frame construction.
 - 3. Lintels.
 - 4. Metal bollards.
- B. Products furnished, but not installed, under this Section:
 - 1. Loose steel lintels.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.
- B. Sustainable Design Submittals:
 - 1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.3 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.6 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- D. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.
- F. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches.

2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.

2.3 FASTENERS

- A. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- B. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- C. Eyebolts: ASTM A 489.
- D. Machine Screws: ASME B18.6.3.
- E. Lag Screws: ASME B18.2.1.
- F. Wood Screws: Flat head, ASME B18.6.1.
- G. Plain Washers: Round, ASME B18.22.1.
- H. Lock Washers: Helical, spring type, ASME B18.21.1.
- I. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- J. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- K. Post-Installed Anchors: Torque-controlled expansion anchors, chemical anchors, or screw anchors per construction documents.
 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

- L. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- G. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
 - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
 - 2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.
- D. Galvanize miscellaneous framing and supports where indicated.

2.7 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim.
- D. Prime interior miscellaneous steel trim with primer specified in Division 09 Section "Painting."

2.8 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 80 steel pipe.
- B. Fabricate bollards with 3/8-inch- thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
 - 1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
- C. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.
- D. Prime bollards with primer specified in Division 09 Section "Painting."

2.9 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
- B. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.
 - 1. Embed anchor bolts at least 4 inches in concrete.
- C. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
- D. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- E. Fill bollards solidly with concrete, mounding top surface to shed water.

3.4 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonshrink grout, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel pipe and tube railings.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.
- B. Sustainable Design Submittals:
 - 1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- D. Samples for Initial Selection: For products involving selection of color, texture, or design.
- E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.2 STEEL AND IRON

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Tubing: ASTM A 513.
- C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- D. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.3 FASTENERS

- A. General: Provide the following:
 - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
 - 2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.

2. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining loads as designed by the railing engineer
1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- E. Wall Rail Brackets: No. 306, manufactured by Julius Blum.
1. Galvanized for exterior exposure.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
1. For railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- F. Shop Primer for Galvanized Steel: Water based galvanized metal primer complying with MPI#134.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- J. Form changes in direction as follows:
 - 1. By bending, unless otherwise indicated.
- K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- P. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- Q. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
 - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 - 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 5. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Other Railings: SSPC-SP 3, "Power Tool Cleaning."
- F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - 1. Shop prime uncoated railings with universal shop primer indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. For interior railings, cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
- D. For exterior railings, leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.
- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ATTACHING RAILINGS

- A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.
- B. Attach railings to wall with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets and railing end flanges to building construction as follows:
1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 2. For hollow masonry anchorage, use toggle bolts.
 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

3.6 ADJUSTING AND CLEANING

- A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05 52 13

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

- A. Submittals: ICC-ES evaluation reports for wood-preservative treated wood, fire-retardant treated wood, engineered wood products, shear wall panels, and metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: Provide dressed lumber, S4S, marked with grade stamp of inspection agency.
- B. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 - 1. Allowable Design Stresses: Engineered wood products shall have allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be demonstrated by comprehensive testing.

2.2 TREATED MATERIALS

- A. Preservative-Treated Materials: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Use treatment containing no arsenic or chromium.
 - 2. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
 - 3. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- B. Provide preservative-treated materials for items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, blocking, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing members that are less than 18 inches above the ground.
 - 4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FRAMING

- A. Dimension Lumber:
 - 1. Maximum Moisture Content: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness.
 - 2. Non-Load-Bearing Interior Partitions: No. 1/No. 2 Spruce Pine Fir. :SPIB.

3. Load Bearing Interior and Exterior Stud Framing No. 1/No. 2 Spruce Pine Fir/Elevated Beams and Headers: No. 1 Southern Yellow Pine
 4. Dimensional Posts (4x4) No. 1 Southern Yellow Pine
 5. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
 - a. Species: As specified for framing other than non-load-bearing interior partitions.
 - b. Grade: No. 1.
- B. Timbers 5-Inch Nominal Size and Thicker: No. 1: Southern pine: SPIB.
1. Maximum Moisture Content: 20 percent.
- C. Laminated-Veneer Lumber: Manufactured with exterior-type adhesive complying with ASTM D 2559. Allowable design values determined according to ASTM D5456.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Georgia-Pacific Gypsum LLC.
 - b. Louisiana-Pacific Corporation.
 - c. Stark Truss Company, Inc.
 - d. Weyerhaeuser
 2. Extreme Fiber Stress in Bending, Edgewise: As noted on construction documents
 3. Modulus of Elasticity, Edgewise: 1,900,000 psi.
- D. Wood I-Joists: Prefabricated units complying with material requirements of and with structural capacities established and monitored according to ASTM D5055.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anthony-Domtar Inc.
 - b. Georgia-Pacific Gypsum LLC.
 - c. International Paper Corporation.
 - d. J. M. Huber Corporation.
 - e. Louisiana-Pacific Corporation.
 - f. Stark Truss Company, Inc.
 - g. Weyerhaeuser, Inc.
 2. Web Material: Either oriented strand board or plywood, Exposure 1.
 3. Structural Properties: Provide units with depths and design values not less than those indicated.
 4. Provide units complying with APA PRI-400, factory marked with nominal joist depth, joist class, span ratings, mill identification, and compliance with APA standard.
- E. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists.
1. Manufacturer: Provide products by same manufacturer as I-joists.
 2. Material: All-veneer product, glued-laminated wood, or product made from any combination solid lumber, wood strands, and veneers.
 3. Thickness: 1-1/4 inches.

2.4 MISCELLANEOUS LUMBER

- A. Miscellaneous Dimension Lumber: Construction, or No. 2 grade with 15 percent maximum moisture content of any species. Provide for nailers, blocking, and similar members.
- B. Utility Shelving: [Eastern white, Idaho white, lodgepole, ponderosa, or sugar pine, Premium or 2 Common (Sterling): NeLMA, NLGA, WCLIB, or WWPA;] [Mixed southern pine, No. 1: SPIB;] [Hem-fir, Select Merchantable or No. 1 Common: NLGA, WCLIB, or WWPA;] [or] [Spruce-pine-fir, Select Merchantable or No. 1 Common: NeLMA, NLGA, WCLIB, or WWPA;] with [15] [19] percent maximum moisture content.
- C. Concealed Boards: [Eastern softwoods, No. 3 Common: NELMA;] [Northern species, No. 3 Common: NLGA;] [Mixed southern pine, No. 2: SPIB;] [or] [Western woods, Standard: WCLIB; or No. 3 Common: WWPA;] with [15] [19] percent maximum moisture content.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, Exterior, AC, fire-retardant treated, not less than 1/2-inch nominal thickness.

2.6 MISCELLANEOUS PRODUCTS

- A. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners [with hot-dip zinc coating complying with ASTM A 153/A 153M] [of Type 304 stainless steel].
 - 1. Power-Driven Fasteners: CABO NER-272.
 - 2. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- B. Metal Framing Anchors: Structural capacity, type, and size indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cleveland Steel Specialty Co.
 - b. KC Metals Products, Inc.
 - c. Phoenix Metal Products, Inc.
 - d. Simpson Strong-Tie Co., Inc.
 - e. USP Structural Connectors.
 - 2. Use anchors made from hot-dip galvanized steel complying with ASTM A 653/A 653M, G60 coating designation for interior locations where stainless steel is not indicated.
 - 3. Use anchors made from stainless steel complying with ASTM A 666, Type 304 for exterior locations and where indicated.
- C. Sill Sealer: Closed-cell neoprene foam, 1/4 inch thick.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Do not splice structural members between supports unless otherwise indicated.
- D. Securely attach rough carpentry to substrates, complying with the following:
 - 1. CABO NER-272 for power-driven fasteners.
 - 2. Published requirements of metal framing anchor manufacturer.
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings].

END OF SECTION 06 10 00

SECTION 06 15 23 - COMPOSITE WOOD

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Wood plastic composite made from 60% wood-like cellulose fiber and 40% reclaimed plastics, not use for framing or structural members.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. ASTM C1028 Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
 2. ASTM D648 Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
 3. ASTM D1037 Standard Test Method for Evaluating Properties of Wood-Base Fiber and Particle Panel Material.
 4. ASTM D1413 Standard Test Method for Wood Preservatives by Laboratory Soil-Block Cultures.
 5. ASTM D143 Standard Test Methods for Small Clear Specimens of Timber.
 6. ASTM D1525 Standard Test Method for Vicat Softening Temperature of Plastics.
 7. ASTM D1761 Standard Test Method for Mechanical Fasteners in Wood.
 8. ASTM D1929 Standard Test Method for Determining Ignition Temperature of Plastics.
 9. ASTM D2017 Standard Test Method for Accelerated Laboratory Test or Natural Decay Resistance of Wood.
 10. ASTM D2240 Standard Test Method for Rubber Property – Durometer Hardness.
 11. ASTM D2244 Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
 12. ASTM D2394 Standard Methods for Simulated Service Testing of Wood and Wood-Base Finish Flooring.
 13. ASTM D256 Standard Test Method for Determining the Pendulum Impact of Notched Specimens of Plastics.
 14. ASTM D2565 Standard Practice for Xenon Arc Exposure of Plastics Intended for Outdoor Applications.
 15. ASTM D3345 Standard Test Method for Laboratory Evaluation of Wood and Other Cellulosic Materials for Resistance to Termites.
 16. ASTM D4060: Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
 17. ASTM D4761 Standard Test Method for Mechanical Properties of Lumber and Wood-Base Structural Material.
 18. ASTM D6109 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber.

19. ASTM D6117 Standard Test Methods for Mechanical Fasteners In Plastic Lumber and Shapes.
 20. ASTM D6341 Standard Test Method for Determination of the Linear Coefficient of Thermal Expansion of Plastic Lumber and Plastic Lumber Shapes Between -30 and 140°F (-34.4 and 60°C).
 21. ASTM D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
 22. ASTM D638 Standard Test Method for Tensile Properties of Plastic.
 23. ASTM D6662 Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards.
 24. ASTM D696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer.
 25. ASTM D790 Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 26. ASTM D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
 27. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. International Code Council (ICC):
1. International Building Code, 2006.
- C. Nexwood Industries Limited:
1. Nexwood Contractor's Handbook and Instruction Guide.
- D. Additional Test Results:
1. Full Scale Load Test as per BOCA NBC 1710.3.1.
 2. Uniform Load and Creep Relaxation as per ICCAC-174.
 3. Full Scale Railing System Test as per BOCA NBC 1606.4 and section 4.4 ASCE 7.
 4. Full Scale Railing System Test as per 1997 Ontario Building Code and 1995 National Building Code of Canada Section 1.1.10.1 (1) © and (2).
 5. Stair Tread Concentrated Load Test as ICBO AC174 section 4.1.3.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements: Ultimate strength values are not meant for design analysis. Testing performed on a 2x6 cross section. Design values are for temperatures up to 1300 F (540C).
1. Structural properties: Ultimate Value/Design Value:
 - a. Compression Parallel to Length (ASTM D6108): 1,970 psi.
 - b. Tensile Strength of Beam (ASTM D638): 2,230 psi.
 - c. Tensile Strength of Material (ASTM D638): 2,840 psi.
 - d. Modulus of Rupture (ASTM D6109): 2,923 psi/1,144 psi.
 - e. Modulus of Elasticity (ASTM D6109): 403,068 psi/230,749 psi.

1.4 SUBMITTALS

- A. General: Submit listed submittals in accordance with conditions of the contract and submittal procedure.
- B. Product Data: Submit manufacturer's product data, maintenance recommendations and installation manual including joints' details.
- C. Samples: Submit selected and verified samples of composite lumber and or railing in color as selected by Architect. Some color variation in boards exposed to weathering is normal and should be expected. All colors will fade when exposed to sunlight and natural weathering.
- D. Warranty documents specified herein.

1.5 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with product requirement section.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged conditions, fitted with a protective Nexwood plastic wrap with stringers and straps; identification labels remain intact. These units should be off loaded using forklift and must be lifted from the center, between the crossers, to prevent the unit from dropping.
- C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions.
 - 1. Immediately upon delivery to jobsite, place materials in area protected from weathering. Keep the units covered with protective Nexwood wrap, including any exposed ends.
 - 2. Units from the same shipment should be stored together or the wrap dated to reduce mixed production lots.
 - 3. Store Nexwood products on a flat surface.
 - 4. When stacking bundled units, line up supports vertically. The distance between the stringers at least 38.5" to prevent sagging.

1.6 WARRANTY

- A. Manufacturer's Limited Warranty: No warranty claim shall be honored without presentation of the Limited Warranty Form, proof of purchase, and submission of "certificate of installation" (if one should apply).
 - 1. Provide manufacturer's non-transferable limited warranty against splitting, rot, and/or termite attack.
 - 2. Warranty Period: 20 years beginning with proof of dated purchase receipt for 2x6 Nexwood board and 10 years for 5/4 Tongue and Groove Nexwood board and 5/4 REB.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Composite Wood Lumber and Materials:

1. Nexwood Industries Limited, 1327 Clark Boulevard, Brampton, Ontario, Canada L6T 5R5; Telephone: 1-888-763-9966; Fax: 905-799-3663; E-mail: inquiry@nexwood.com; website: www.nexwood.com.
2. Trex Company, Inc.

2.2 PROPRIETARY PRODUCTS/SYSTEMS

A. Nexwood is manufactured by an extrusion process per manufacturer's quality control manual.

1. Nexwood Composite Lumber:
 - a. Material Description: Hollow composite material consists of approximately 60 pph wood-like cellulose fiber by weight with 40 pph reclaimed plastics and 1 pph additives.
 - b. Nexwood profiles manufactured in specified length: 8, 12, 16, 20 ft.
 - c. Color: Natural, Driftwood Grey, Sierra Brown, Sequoia Red.
 - d. Self-Ignition Temperature (ASTM D1929): > 8420 F (4500C).
 - e. Flammability (ASTM E84): Flame spread index 65, smoke developed index 340; Class B (Class II).
 - f. Rate of Burning (ASTM D635): 0.68"/min.
 - g. Solubility in Water: Negligible.
 - h. Toxicity: no harmful material.
 - i. Water Absorption (ASTM D1037): < 0.8%.
 - j. Relative Density (ASTM D792): 1.167 g/cm³.
 - k. Specific Gravity (ASTM D792): 1.170.
 - l. Bulk Density (ASTM D6111): 0.510 g/cm³.
 - m. Specific Gravity (ASTM D6111): 0.511.
 - n. Coefficient of linear thermal expansion (ASTM D696): 2.60X10⁻⁵ in/in/10F (5.79X10⁻⁵ in/in/10C).
 - o. Resistance to Termite Block Evaluation rating (ASTM D3345): 10 (no damage).
 - p. Fungus Resistance Rating (ASTM D2017): < 3% (highly resistant).
 - q. Static Coefficient of Friction (ASTM C1028): 0.58 when dry, and 0.64 when wet.
 - r. Hygrothermal Cycles (ASTM D6662): average flexural strength change = minus 0.4%.
 - s. Weathering test (ASTM D2565-2000 hours & D2244): noticeable change.
 - t. Screw Uplift (ASTM D2047): 312 lb.
 - u. Lateral Withdrawal (ASTM D6117): 392 lb.
 - v. VICAT Softening Temperature (ASTM D1525): 99.3 0C (210.7 0F).
 - w. Heat Deflection temperature (ASTM D648): 71.2 0C (160.2 0F).
 - x. Abrasion (ASTM D4060): 0.0738g/1000 cycles.
 - y. Hardness (ASTM D2240): Shore D-68.

2.3 ACCESSORIES

- A. End caps, C-channel, E-channel, post cap, fastening screws.
- B. Bolts, Exterior Use:
 - 1. Material Standard: Comply with ASTM A307, with standard washers.
 - 2. Finished: Galvanized, ASTM A123.
 - 3. Size: Diameter less than or equal to ½" (12.7 mm).
- C. Screws:
 - 1. 2x6 Nexwood board: #7x3" Trim Head Swan Secure Stainless Steel.
 - 2. 5/4 Tongue and Groove: TrapEase 2½" Fasten Master Composite Deck Screw (do not apply to the deck surface!).
 - 3. 5/4x6 REB Nexwood board: #7x2-1/4" Trim Head Swan Secure Stainless Steel.
- D. Adhesive:
 - 1. OSI/LePage PL-400 Sub-Floor & Decking Adhesive.
 - 2. Devcon, Plastic Welder-II.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Comply with the methods detailed in Nexwood Contractor's Handbook and Installation Guide.

3.2 EXAMINATION

- A. Site Verification of Conditions:
 - 1. Verify that site conditions are acceptable for installation of Nexwood products.
 - 2. Do not proceed with installation of Nexwood products until unacceptable conditions are corrected.

3.3 INSTALLATION

- A. Install in accordance with most recent version Contractor's Handbook and Installation Guide.
- B. Ensure boards are gapped end to end and width to width as described in the Nexwood Contractor's Handbook and Installation Guide.
- C. Avoid butting boards of 20 feet in length end to end (≤16 ft); use other alternative design of your deck with different levels (elevations) or Herringbone pattern.

- D. Use manufacturer's gapping guidelines to calculate end spacing due to temperature change.
- E. Always use double joists for each butt joint.
- F. Avoid building less than 12 ft from the ground without ventilation.
- G. Do not attach lumber to any solid surface or watertight system.
- H. Ensure lumber spans do not exceed the specifications of Nexwood Span Chart.

3.4 CLEANING

- A. Comply with cleaning instructions as described in Nexwood Contractor's Handbook and Installation Guide.
- B. At completion of work, remove debris caused by installation from project site and wash the entire deck with pressure washer. Periodic cleaning is necessary to keep the deck looking great.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 06 15 23

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Wall sheathing.
 2. Roof sheathing.
 3. Subflooring.
 4. Underlayment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Sustainable Design Submittals:
1. For adhesives, documentation including printed statement of VOC content.
 2. For composite wood products, documentation indicating that product contains no urea formaldehyde.
 3. For adhesives and composite wood products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For following products, from ICC-ES:
1. Preservative-treated plywood.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and undercoverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
 - 1. Plywood.
 - 2. Underlayment.
- C. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.
- D. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- E. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 WALL SHEATHING

- A. Plywood Wall Sheathing: Exposure 1 Sheathing
 - 1. Span Rating: Not less than 32/16
 - 2. Nominal Thickness: Not less than 15/32 inch.

2.4 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.
 - 1. Span Rating: Not less than 40/20.
 - 2. Nominal Thickness: Not less than 19/32 inch.

2.5 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exposure 1 Sheathing, , C- D single-floor panels.
 - 1. Span Rating: Not less than 24 o.c.
 - 2. Nominal Thickness: Not less than 23/32 inch.
 - 3. Edge Detail: Tongue and groove.
 - 4. Surface Finish: Fully sanded face.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG- 01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 1. Combination Subfloor-Underlayment:
 - a. Glue and nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - c. Provide nailing pattern as dictated in structural documents.
 2. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.

- c. Provide nailing patterns according to shear wall schedules and typical structural details
- 3. Underlayment:
 - a. Nail to subflooring.
 - b. Space panels 1/32 inch apart at edges and ends.
 - c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

END OF SECTION 06 16 00

SECTION 06 16 70 – COMPOSITE WOOD PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Sound Barrier Board.

1.2 REFERENCES

- A. APA The Engineered Wood Association (APA): APA AFG-01 – Specification for field gluing subfloors.
- B. American Society for Testing and Materials (ASTM):
 1. ASTM C 209 - Test Methods for Cellulosic Fiber Insulating Board.
 2. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 3. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
- C. UL listed, File R16381.
- D. Forest Stewardship Certification (FSC): CoC Cert no. 5682.
- E. ICC-ES Report ESR-1374.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- 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.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 10-years experience in producing sound-deadening boards.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging with labels intact until ready for installation.

- B. Inspect the materials upon delivery to assure that specified products have been received. Report damaged material immediately to the delivering carrier and note such damage on the carrier's freight bill of lading.
- C. Store materials in a dry place, indoors, on raised platform protected from weather damage.

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. Climatize panels to existing moisture conditions and for not less than 24 hours before installation. Comply with manufacturer's recommendations for acclimatization.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. Homasote Company; 932 Lower Ferry Road, West Trenton, NJ 08628. Tel: (800) 257-9491. Tel: (609) 883-3300. Fax: (609) 883-3497. Email: sales@homasote.com Website: www.homasote.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
- C. Substitutions: Not permitted.
- D. Provide all acoustical wall panels from a single manufacturer.

2.2 MATERIALS

- A. 440 SoundBarrier: Class C fire-rated. Molded, recycled post-consumer paper, cellulose fiber structural panel. Physical properties as follows:
 - 1. Thickness: 1/2 inch (13 mm).
 - 2. Density: 26-28 pcf (416-448 kg/cu. m) tested in accordance with ASTM C 209.
 - 3. Tensile Strength: When tested in accordance with ASTM C 209: a. Parallel: 450-700 psi (3,100-4,830 kPa). b. Transverse: 750-1000 psi (5.1171-6.894 kPa).
 - 4. Hardness (Janka Ball): 230 lbs (104 kg) tested in accordance with ASTM D 1037.
 - 5. Water Absorption by Volume: When tested in accordance with ASTM C 209:
 - a. 2 hour immersion: 7 percent maximum.

6. Expansion: 50 to 90 percent relative humidity, 0.25 percent in accordance with ASTM C 209.
7. Thermal Resistance: When tested in accordance with ASTM C 209 per ASTM C 518:
 - a. R-value: 1.2 for 1/2 inch (13 mm) thick board.
 - b. K-value: .512 Btu-in/ (h ft² °F).
8. Noise reduction coefficient (NRC): 0.20
9. Flame Spread: 76 to 200 tested in accordance with ASTM E 84, Class III or C.

2.3 ACCESSORIES

- A. Adhesive: APA AFG-01 specification sub-floor adhesive.
- B. Panel Fasteners:
 1. Nails, Wood Framing: annular thread type (ring shank) of length required to penetrate not less than 3/4 inch (19 mm) into subfloor.
 2. Screws: Coarse thread drywall type wood screw of length required to penetrate not less than 3/4 inch (19 mm) into sub-floor.
 3. Metal Framing: 22-25 gauge, drywall type steel screw.
- C. Drywall fastener for decoupled wall installation.
 1. #10 drywall screw or laminating screw.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates upon which work will be installed.
- B. Verify framing member spacing complies with manufacturer's requirements depending on substrates and installation methods.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Verify what environmental conditions are, and will continue to be maintained in accordance with manufacturer's recommendations.
- E. Starting work by installer is acceptance of substrate and environmental conditions.

3.2 PREPARATION

- A. Follow manufacturer's instructions by separating and allowing panels to be exposed to environmental temperature and humidity conditions for not less than 24 hours before start of installation.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install only clean dry panels. Do not install wet panels.
- C. Floor Panel Installation: Space panel joints 3/16 inch (5 mm) apart; 3/8 inch (10 mm) space at walls and partitions. Stagger joints.
- D. Wall Panel Installation: Space panel joints 1/8 inch (3 mm) apart; 1/4 inch (6 mm) space at floors, ceilings, and window and door frames. Install gypsum wallboard or other wall finish panels so that finish panel joints are staggered and do not coincide with sound barrier panel joints. Install in accordance with finish panel manufacturer's installation recommendations.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

3.5 CLEANING

- A. Comply with manufacturer's recommendations for repairing damaged panels.
- B. Replace panels that cannot be repaired.

END OF SECTION 06 16 70

SECTION 06 1733 WOOD I-JOISTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wood I-joists for roof and floor framing.
- B. Bridging, bracing, and anchorage.
- C. Framing for openings.

1.2 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.
- B. Section 06 1000 - Rough Carpentry: Material requirements for blocking, plates, and miscellaneous framing.

1.3 REFERENCE STANDARDS

- A. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a.
- B. ASTM D5055 - Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists; 2016.
- C. PS 1 - Structural Plywood; 2009.
- D. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

1.4 DESIGN REQUIREMENTS

- A. Design Floor Live Load: 40 lbs/sq ft (25.5 kPa) with live load deflection limited to 1/480 of span.
- B. Design Floor Dead Load: 25.5 lbs/sq ft with total deflection limited to 1/240 of span

1.5 SUBMITTALS

- A. See Section 01 3000 - 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.

1.6 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

2.1 MANUFACTURERS

- A. Wood I-Joists:
 - 1. Georgia-Pacific Corporation; www.buildgp.com.
 - 2. LP Building Products: www.lpcorp.com.
 - 3. Weyerhaeuser; www.woodbywy.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.2 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 (0.8 mm).
 - b. Flange Thickness: Minus 1/16 inch (1.6 mm).
 - c. Joist Depth: Plus 0, minus 1/8 inch (3.2 mm).
 - 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. Joist Hangers: Per Structural Documents.

- C. Joist Bridging: Type, size and spacing recommended by joist manufacturer.
- D. Wood Blocking, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, maximum moisture content of 19 percent.
- E. Wood Blocking, Plates, and Miscellaneous Framing: As specified in Section 06 1000.
- F. Fasteners: Electrogalvanized steel, type to suit application.
- G. Bearing Plates: Electrogalvanized steel, unfinished.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that supports and openings are ready to receive joists.
- B. Verify that field measurements are as indicated on shop drawings.

3.2 PREPARATION

- A. Coordinate placement of bearing items.

3.3 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 1000.
- H. Coordinate installation of sheathing/decking with work of this section.

3.4 TOLERANCES

- A. Framing Members: 1/2 inch (12 mm) maximum, from true position.

END OF SECTION

SECTION 06 17 53 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wood roof trusses.
 - 2. Wood truss bracing.
 - 3. Metal truss accessories.
- B. Related Requirements:
 - 1. Division 06 Section "Sheathing" for roof sheathing and subflooring.

1.2 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.
- B. Shop Drawings: Show fabrication and installation details for trusses.
 - 1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
 - 2. Indicate sizes, stress grades, and species of lumber.
 - 3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
 - 4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
 - 5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
 - 6. Show splice details and bearing details.
- C. Delegated-Design Submittal: For metal-plate-connected wood trusses 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. Roof truss design shall comply with all loading requirements listed on the structural construction documents.

1.4 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction and is certified for chain of custody by an FSC-accredited certification body.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design metal-plate-connected wood trusses.

B. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

1. Design Loads: As indicated.
2. Maximum Deflection Under Design Loads:
 - a. Roof Trusses: Vertical deflection of 1/240 of span.

C. Comply with applicable requirements and recommendations of the following publications:

1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
 2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
 3. TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

- A. Certified Wood: For metal-plate-connected wood trusses and permanent bracing, provide materials produced from wood obtained from forests certified by an FSC- accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Provide dressed lumber, S4S.
 3. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- C. Minimum Chord Size for Roof Trusses: 2 by 4 inches nominal for both top and bottom chords.
- D. Minimum Specific Gravity for Top Chords: 0.50.
- E. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Division 06 Section "Rough Carpentry."

2.3 METAL CONNECTOR PLATES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Alpine Engineered Products, Inc.; an ITW company.
 2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
 3. CompuTrus, Inc.
 4. Eagle Metal Products.
 5. Jager Building Systems, Inc.; a Tembec/SGF Rexfor company.
 6. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
 7. Robbins Engineering, Inc.
 8. Truswal Systems Corporation; an ITW company.
- B. Source Limitations: Obtain metal connector plates from single manufacturer.
- C. General: Fabricate connector plates to comply with TPI 1.

- D. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.
 - 1. Use for interior locations unless otherwise indicated.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
 - 2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cleveland Steel Specialty Co.
 - 2. KC Metals Products, Inc.
 - 3. Phoenix Metal Products, Inc.
 - 4. Simpson Strong-Tie Co., Inc.
 - 5. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- D. Truss Tie-Downs: Bent strap tie for fastening roof trusses to wall studs below, 1-1/2 inches wide by 0.050-inch thick.
- E. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of truss and fastens to both sides of truss, top plates, and one side of stud below.
- F. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches wide by 0.050 inch thick. Clip is fastened to truss through slotted holes to allow for truss deflection.

- G. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches wide by 1 inch deep by 0.040-inch thick, made to fit between two adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

2.7 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
 - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.8 SOURCE QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform special inspections.
 - 1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
 - 2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.
- B. Correct deficiencies in Work that special inspections indicate does not comply with the Contract Documents.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses 24 inches o.c.; adjust and align trusses in location before permanently fastening.
- G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
 - 1. Anchor trusses to girder trusses as indicated.
- H. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. Install bracing to comply with Division 06 Section "Rough Carpentry."
 - 2. Install and fasten strongback bracing vertically against vertical web of parallel- chord floor trusses at centers indicated.
- I. Install wood trusses within installation tolerances in TPI 1.
- J. Do not alter trusses in field. Do not cut, drill, notch, or remove trussmembers.
- K. Replace wood trusses that are damaged or do not meet requirements.
 - 1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

3.2 REPAIRS AND PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- C. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- D. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.

1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION 06 17 53

SECTION 06 20 13 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior wood trim.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
 - 4. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.
- B. Sustainable Design Submittals:
 - 1. For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - 2. Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC- accredited certification body. Include statement indicating cost for each certified wood product.
- C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- D. Samples for Verification:
 - 1. For each species and cut of lumber and panel products, with 1/2 of exposed surface finished; 50 sq. in. for lumber.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.5 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
 - 1. For exterior ornamental wood columns, comply with manufacturer's written instructions and warranty requirements.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Regional Materials: The following wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
 - 1. Exterior trim.
- B. Lumber: DOC PS 20 and the following grading rules:
 - 1. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
 - 2. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
- C. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC3b.
 - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent respectively.
 - 2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 3. Do not use material that is warped or does not comply with requirements for untreated material.
 - 4. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.
 - 5. Application: Where indicated.

2.3 EXTERIOR TRIM

- A. Lumber Trim for Painted Finish:
 - 1. Species and Grade: Hem-fir, Prime or D finish; NLGA.
 - 2. Species and Grade: Eastern white pine, eastern hemlock-balsam fir-tamarack, eastern spruce, or white woods; D Select (Quality); NLGA.
 - 3. Maximum Moisture Content: 19 percent.
 - 4. Finger Jointing: Allowed if made with wet-use adhesive complying with ASTM D 5572.
 - 5. Face Surface: Surfaced (smooth).
 - 6. Factory Priming: Factory coated on faces and edges with exterior primer compatible with topcoats specified.
- B. Moldings for Painted Finish: WMMPA WM 4, P-grade wood moldings. Made from kiln-dried stock to patterns included in WMMPA WM 12.
 - 1. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
 - 2. Finger Jointing: Allowed if made with wet-use adhesive complying with ASTM D 5572.
 - 3. Factory Priming: Factory coated on faces and edges with exterior primer compatible with topcoats specified.
 - 4. Profiles: As indicated on the Drawing or to match existing on Building E.

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. For pressure-preservative-treated wood, provide stainless-steel fasteners.
 - 2. For applications not otherwise indicated, provide stainless-steel or aluminum fasteners.
- B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.

- C. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and with applicable requirements in Section 07 92 00 "Joint Sealants," recommended by sealant manufacturer and manufacturer of substrates for intended application.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Sonolac.
 - b. Bostik, Inc.; Chem-Calk 600.
 - c. May National Associates, Inc.; Bondaflex 600.
 - d. Pecora Corporation; AC-20+.
 - e. Schnee-Morehead, Inc., an ITW company; SM 8200.
 - f. Tremco Incorporated; Tremflex 834.

2.5 FABRICATION

- A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in Section 09 91 13 "Exterior Painting."

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install flat-grain lumber with bark side exposed to weather.
- B. Install foam plastic moldings to comply with manufacturer's written instructions.
- C. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.
 1. Use scarf joints for end-to-end joints.
 2. Stagger end joints in adjacent and related members.
- D. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
- E. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean exterior finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 13

SECTION 06 20 23 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior trim.
 - 2. Wire shelving.
 - 3. Interior stairs and railings.

1.2 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. MDO: Plywood with a medium-density overlay on the face.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
 - 4. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.
- B. Sustainable Design Submittals:
 - 1. Product Certificates: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - 2. Product Data: For adhesives and glues used at Project site, documentation including printed statement of VOC content.
 - 3. Product Data: For composite wood products, documentation indicating that product contains no urea formaldehyde.

4. Laboratory Test Reports for Credit IEQ 4: For adhesives and composite wood products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For fire-retardant-treated wood, from ICC-ES.
- B. Sample Warranty: For manufacturer's warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Regional Materials: The following wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

1. Interior trim.
2. Fire-rated interior door frames.
3. Shelving and clothes rods.
4. Interior stairs and railings.

B. Low-Emitting Materials: Composite wood products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small- Scale Environmental Chambers."

C. Lumber: DOC PS 20 and the following grading rules:

1. NHLA: National Hardwood Lumber Association, "Rules for the Measurement and Inspection of Hardwood & Cypress."
2. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
3. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."

D. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

E. MDF: ANSI A208.2, Grade 130, made with binder containing no urea-formaldehyde resin.

F. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

1. Color: As selected by Architect from manufacturer's full range.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC2.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent respectively.
2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
4. Do not use material that is warped or does not comply with requirements for untreated material.
5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.
 - a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
7. Application: Where indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction, and comply with testing requirements; testing by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent respectively.
- C. For exposed items indicated to receive a stained or natural finish, use organic resin chemical formulations that do not contain colorants, and provide materials that do not have marks from spacer sticks on exposed face.
- D. Do not use material that does not comply with requirements for untreated material or is warped or discolored.
- E. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
 2. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
- F. Application: All interior lumber and plywood used in fire-rated assemblies.

2.4 INTERIOR TRIM

- A. Lumber Trim for Opaque Finish (Painted Finish):
 1. Species and Grade: Alder, aspen, basswood, cottonwood, gum, magnolia, soft maple, sycamore, tupelo, or yellow poplar; A Finish; NHLA.
 2. Maximum Moisture Content: 19 percent.
 3. Finger Jointing: Allowed.
 4. Face Surface: Surfaced (smooth).
 5. Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.

- B. Moldings for Opaque Finish (Painted Finish): Made to patterns included in WMMPA WM 12.
 - 1. Hardwood Moldings: WMMPA HWM 2, P-grade.
 - a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
 - b. Maximum Moisture Content: 9 percent.
 - 2. Optional Material: Primed MDF.
 - 3. Finger Jointing: Allowed.
 - 4. Profiles: As indicated on the Drawings.

2.5 SHELVING AND CLOTHES RODS

- A. Wire Shelving: Wire Shelving with Fixed Mount Hardware System, manufactured by Closet Maid.
 - 1. Shelving Type: Total Side.
 - 2. Provide the following mounting hardware:
 - a. Pre-loaded Wall Clips: 910.
 - b. Support Bracket: 1164.
 - c. Pre-loaded Sidewall Bracket: 932.
 - d. Pre-loaded Wall Anchor: 935.
 - e. Small End Caps: 203.
 - f. Large End Caps: 204.
 - g. Pre-loaded Down Clip: 981.
 - h. Shelf End Cap: 969.

2.6 STAIRS AND RAILINGS

- A. Treads: 1-1/16-inch, clear, kiln-dried, edge-glued, poplar stepping with half-round nosing.
- B. Risers: 13/16-inch, clear, kiln-dried, edge-glued poplar stock.
- C. Finished Stringers: 3/4-inch finish boards as specified above for interior lumber trim for opaque finish.
- D. Interior Railings: Clear, kiln-dried yellow poplar, of pattern indicated, either solid or laminated.

2.7 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- C. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
 - 1. Wood glue shall have a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
 - 1. Adhesive shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 FABRICATION

- A. Back out or kerf backs of the following members except those with ends exposed in finished work:
 - 1. Interior standing and running trim except shoe and crown molds.
 - 2. Wood-board paneling.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, too small to fabricate with proper jointing arrangements, or with defective surfaces, sizes, or patterns.

- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
 - 5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 2. Install trim after gypsum-board joint finishing operations are completed.
 - 3. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 SHELVING AND CLOTHES ROD INSTALLATION

- A. Install wire shelving in accordance with the manufacturer's written instructions for conditions encountered.

3.6 STAIR AND RAILING INSTALLATION

- A. Treads and Risers at Interior Stairs: Secure treads and risers by gluing and nailing to rough carriages.
 - 1. Closed Stringers: Cope wall stringers to fit tightly over treads and risers.
- B. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws or rail bolts, and glue. Assemble railings at goosenecks, easements, and splices with rail bolts and glue.

3.7 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.8 CLEANING

- A. Clean interior finish carpentry on exposed and semi-exposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.

3.9 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 23

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

- A. Submittals: Product Data.
- B. Surface-Burning Characteristics: According to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

PART 2 - PRODUCTS

2.1 INSULATION PRODUCTS

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, with flame-spread and smoke-developed indexes of 75 and 450, respectively.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Kingspan Insulation Limited.
 - d. Owens Corning.
 - 2. Thickness: 2 inches.
 - 3. Provide where perimeter insulation under slab-on-grade is noted.
- B. Glass-Fiber-Blanket Insulation: ASTM C 665, Type 1, unfaced and Type II, kraft-faced.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 2. Thickness: Match stud depth.
- C. Mineral-Fiber-Blanket Insulation: ASTM C 665, Type I, unfaced with flame-spread index of 25 or less.
 - 1. Thickness: 3 inches.
 - 2. Provide where sound attenuation is noted.

2.2 ACCESSORIES

- A. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed to fit between roof framing members and to provide cross-ventilation between insulated attic spaces and vented eaves.

- B. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame- spread and smoke-developed indexes of 5, per ASTM E 84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install insulation in areas and in thicknesses indicated or required to produce R-values indicated. Cut and fit tightly around obstructions and fill voids with insulation.
- B. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
- C. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
- D. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage. Locate seams at framing members, overlap, and seal with tape. Seal joints caused by pipes, conduits, electrical boxes, and similar items with tape.

END OF SECTION 07 21 00

SECTION 07 25 00 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Building wrap/air barrier.
 - 2. Flexible flashing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke- developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap
 - b. Reemay, Inc.; Typar MetroWrap.
 - 2. Water-Vapor Permeance: Not less than 150 g through 1 sq. m of surface in 24 hours per ASTM E 96/E 96M, Desiccant Method (Procedure A).
 - 3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg when tested according to ASTM E 2178.
 - 4. Allowable UV Exposure Time: Not less than three months.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.020 inch.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.

- b. Reemay, Inc.; Typar Flashing RA.
- B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- C. Nails and Staples: ASTM F 1667.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
 - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- C. Building Wrap: Comply with manufacturer's written instructions.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where required to comply with manufacturer's written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 4. Lap water-resistive barrier over flashing at heads of openings.
 - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 07 25 00

SECTION 07 31 12 – ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Asphalt roofing shingles.
- B. Leak barrier and roof deck protection.
- C. Metal flashing associated with shingle roofing.
- D. Attic ventilation.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM) - Annual Book of ASTM Standards
 - 1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 3. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.
 - 4. ASTM D 3018 - Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.
 - 5. ASTM D 3161 - Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).
 - 6. ASTM D 3462 – Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules.
 - 7. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
 - 8. ASTM D 7158 - Standard Test Method for Wind-Resistance of Sealed Asphalt Shingles (Uplift Force/Uplift Resistance Method).
 - 9. AC438-1011-R1 – New Acceptance Criteria for Alternative Asphalt Roofing Shingles.
- B. Underwriters Laboratories (UL) - Roofing Systems and Materials Guide (TFWZ.R21)
 - 1. UL 790 - Tests for Fire Resistance of Roof Covering Materials.
 - 2. UL 997 - Wind Resistance of Prepared Roof Covering Materials.
 - 3. UL 2218 – Impact Resistance of Prepared Roof Covering Materials.
- C. Asphalt Roofing Manufacturers Association (ARMA)
- D. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

- E. National Roofing Contractors Association (NRCA)
- F. American Society of Civil Engineers (ASCE).
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- G. ENERGY STAR.
- H. Cool Roof Rating Council (CRRC).

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual for definitions of roofing terms related to this section.

1.4 SUBMITTALS

- A. Submit copies of product data sheets, detail drawings and samples for each type of roofing product.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide all primary roofing products, including shingles, underlayment, leak barrier, and ventilation, by a single manufacturer.
- B. Installer Qualifications: Installer must be approved for installation of all roofing products to be installed under this section.

1.6 REGULATORY REQUIREMENTS

- A. Provide a roofing system achieving an Underwriters Laboratories (UL) Class A fire classification.
- B. Install all roofing products in accordance with all federal, state and local building codes.
- C. All work shall be performed in a manner consistent with current OSHA guidelines.

1.7 PREINSTALLATION MEETING

- A. Timing: The meeting shall take place at the start of the roofing installation, no more than 2 weeks into the roofing project.

- B. Attendees: Meeting to be called for by manufacturer's certified contractor. Meeting's mandatory attendees shall include the certified contractor and the manufacturer's representative. Non-mandatory attendees shall include the owner's representative, architect or engineer's representative, and the general contractor's representative.
- C. Topics: Certified contractor and manufacturer's representative shall review all pertinent requirements for the project, including but not limited to, scheduling, weather considerations, project duration, and requirements for the specified warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store all products in manufacturer's unopened, labeled packaging until they are ready for installation.
- B. Store products in a covered, ventilated area, at temperature not more than 110 degrees F (43 degrees C); do not store near steam pipes, radiators, or in direct sunlight.
- C. Store bundles on a flat, properly drained surface. Maximum stacking height shall not exceed Manufacturer's recommendations. Store all rolls on end.
- D. Store and dispose of solvent-based materials in accordance with all federal, state and local regulations.

1.9 WEATHER CONDITIONS

- A. Proceed with work only when existing and forecasted weather conditions will permit work to be performed in accordance with Manufacturer's recommendations.

1.10 WARRANTY

- A. Provide to the owner a GAF WeatherStopper Golden Pledge[®] Ltd Warranty covering:
 - 1. Roofs installed by a Certified GAF Master Elite Contractor only.
 - 2. Manufacturing defects: 100% coverage for materials and labor for:
 - a. 40 years with the first 20 years non-prorated.
 - 3. Workmanship errors: 100% coverage for workmanship errors for:
 - a. 20 years.
 - 4. Warranted against algae discoloration for 10 years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Asphalt Shingles: Subject to compliance with the Contract Documents, provide products by one of the following:
 - 1. GAF, 1 Campus Drive, Parsippany, NJ 07054. Tel: 1-973-628-3000.

2. Certainteed.
3. Owens-Corning.
4. Tamko.

2.2 SHINGLES

- A. Granule surfaced, high reflectance, self-sealing asphalt shingle with a strong fiberglass reinforced Micro Weave core and a mineral granule surfacing. Architectural laminate styling provides a wood shake appearance with a 5 5/8in. exposure. Features highly reflective roofing granules that bounce back the sun's rays and more effectively release absorbed heat. Rated by the Cool Roof Rating Council (CRRC), Title 24 compliant and meets initial Energy Star performance levels. UL 790 Class A rated with UL 997 Wind Resistance Label; ASTM D 7158, Class H; ASTM D 3161, Type 1; ASTM D 3018, Type 1; ASTM D 3462; AC438 compliant; CSA 123.5-98; Dade County Approved, Florida Building Code Approved, Texas Dept of Insurance Approved, ICC Report Approval. Timberline Cool Series Energy-Saving Architectural Shingles, by GAF.
 1. Color: As selected from manufacturers' full range.

2.3 HIP AND RIDGE SHINGLES

- A. High profile self sealing hip and ridge cap shingle matching the color of selected roof shingle. Each bundle covers approx. 20 lineal feet (6.10m). Timbertex Premium Ridge Cap Shingles, by GAF.

2.4 STARTER STRIP

- A. Self-sealing starter shingle designed for premium roof shingles. Each bundle covers approx. 100 lineal feet (30.48m) for English and metric shingles or 50 lineal feet (15.24m) for oversized shingles. WeatherBlocker Eave/Rake Starter Strip by GAF.

2.5 LEAK BARRIER

- A. Self-adhering, self-sealing, bituminous leak barrier surfaced with fine, skid-resistant granules. Approved by UL, Dade County, ICC, State of Florida and Texas Department of Insurance. Each roll contains approx. 150 sq ft (13.9 sq.m.), 36" X 50' (0.9m x 20.3m) or 200 sq ft (18.6 sq.m.), 36" X 66.7' (0.9m x 20.3m). WeatherWatch Leak Barrier, by GAF.

2.6 SHINGLE UNDERLAYMENT

- A. Premium, water repellent, breather type non-asphaltic underlayment. UV stabilized polypropylene construction. Meets or exceeds ASTM D226 and D4869. Approved by Dade County, Florida Building Code, and ICC. Each roll contains approximately 10 squares (1003 sq. ft.) of material and is 54 in. x 223 ft. Deck-Armor Premium Breathable Roof Deck Protection, by GAF.

2.7 ROOFING CEMENT

- A. Asphalt Plastic Roofing Cement meeting the requirements of ASTM D 4586, Type I or II.

2.8 ROOF ACCESSORIES

- A. UV stable solid molded PVC compression collar, Kynar PVDF coated 24 gauge galvanized flange, Ultimate Pipe Flashing by Lifetime Tool.

2.9 ATTIC VENTILATION

A. Ridge Vents:

1. Flexible rigid plastic ridge ventilator designed to allow the passage of hot air from attics, while resisting snow infiltration. For use in conjunction with eave/soffit ventilation products. Provides 12.5 sq inches Net Free Ventilation Area per lineal foot (26460 sq.mm/m). Each package contains 20 lineal feet (6.10m) of vent. Cobra Ridge Runner Ridge Vent by GAF.

B. Fascia and Soffit/Under Eave Vents

1. Flexible rigid plastic ridge ventilator designed to allow the passage of hot air out of attics at the roof top along the eaves. For use in conjunction with ridge ventilation products. Provides 9.0 sq inches (11613 sq.mm/m) in NFVA per lineal foot. Each package contains 40 lineal feet (12.19m) of vent, Cobra IntakePro Rooftop Intake Vent (includes 1-3/4" (44.5 mm) coil nails), by GAF.

C. Hip Vents

1. Flexible low profile rigid plastic ridge ventilator designed to allow the passage of hot air from attics, while resisting rain and snow infiltration. For use in conjunction with eave/soffit ventilation products. Provides 9 sq inches Net Free Ventilation Area per lineal foot (19,046 sq.m/m). Each package contains 40 lineal feet (12.19m) of vent. Cobra Hip Vent Exhaust Vent by GAF.

2.10 NAILS

- A. Standard round wire, zinc-coated steel or aluminum; 10 to 12 gauge, smooth, barbed or deformed shank, with heads 3/8 inch (9mm) to 7/16 inch (11mm) in diameter. Length must be sufficient to penetrate into solid wood at least 3/4 inch (19mm) or through plywood or oriented strand board by at least 1/8 inch (3.18mm).

2.11 METAL FLASHING

- A. Metal Flashing: 16-oz/sq ft (0.56mm) copper sheet, complying with ASTM B 370.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until the roof deck has been properly prepared.
- B. If roof deck preparation is the responsibility of another installer, notify the architect or building owner of unsatisfactory preparation before proceeding.

3.2 PREPARATION OF SUBSTRATE

- A. Clean deck surfaces thoroughly prior to installation of eaves protection membrane and underlayment.
- B. At areas that receive eaves protection membrane, fill knotholes and cracks with latex filler.
- C. Install crickets on the upslope side of all chimneys in the north, any chimney wider than 24" (610mm), and on all roofs steeper than 6/12.

3.3 INSTALLATION OF UNDERLAYMENTS

- A. General:
 - 1. Install using methods recommended by GAF, in accordance with local building codes. When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.
- B. Eaves:
 - 1. Install eaves edge metal flashing tight with fascia boards; lap joints 2 inches (51mm) and seal with plastic cement or high-quality urethane sealant; nail at the top of the flange.
 - 2. In the north, and on all roofs between 2/12 and 4/12 (low slopes) install GAF leak barrier up the slope from eaves edge a full 36 inches (914mm) or to at least 24 inches (610 mm) beyond the interior "warm wall". Lap ends 6 inches (152mm) and bond.
- C. Valleys:
 - 1. Install eaves protection membrane at least 36 (914mm) inches wide and centered on the valley. Lap ends 6 inches (152mm) and seal.
 - 2. Where valleys are indicated to be "open valleys", install metal flashing over GAF leak barrier before GAF roof deck protection is installed; DO NOT nail through the flashing. Secure the flashing by nailing at 18 inches (457 mm) on center just beyond edge of flashing so that nail heads hold down the edge.
- D. Hips and Ridges:
 - 1. Install GAF leak barrier along entire lengths. If ridge vents are to be installed, position the GAF leak barrier so that the ridge slots will not be covered.

E. Deck-Armor Application:

1. Deck-Armor shall be installed over a clean, dry deck.
2. Install Weather Watch or StormGuard Leak Barrier at eaves, valleys, rakes, skylights, dormers and other vulnerable leak areas.
3. Lay Deck-Armor over deck and overlap 3" (76mm) at side laps and 6" (152mm) at end laps.
4. For exposure to rain or snow, overlap 12" (305mm) at end laps.
5. For side and end laps: fasten Deck-Armor 12" (305mm) o.c. (6" (152mm)o.c. for high wind areas).
6. For middle of the roll: fasten Deck-Armor 24" (610mm) o.c. (12" (305mm) o.c. for high wind areas).
7. For exposure to rail or snow, completely cover all side laps, end laps and fasteners with tape.
8. For long term exposure see complete Deck-Armor installation instructions for side lap detail.
9. If roof may be exposed to high winds, apply tape over all fasteners at the center of the roll to prevent rain or snow from entering at the fasteners.
10. For slopes less than 2:12, a double application of Deck-Armor is required. See complete Deck-Armor installation instructions for more information.

F. Penetrations:

1. Vent pipes: Install a 24 inch (610 mm) square piece of eaves protection membrane lapping over roof deck underlayment; seal tightly to pipe.
2. Vertical walls: Install eaves protection membrane extending at least 6 inches (152mm) up the wall and 12 inches (305mm) on to the roof surface. Lap the membrane over the roof deck underlayment.
3. Skylights and roof hatches: Install eaves protection membrane from under the built-in counterflashing and 12 inches (305mm) on to the roof surface lapping over roof deck underlayment.
4. Chimneys: Install eaves protection membrane around entire chimney extending at least 6 inches (152mm) up the wall and 12 inches (305mm) on to the roof surface. Lap the membrane over the roof deck underlayment.
5. Rake Edges: Install metal edge flashing over eaves protection membrane and roof deck underlayment; set tight to rake boards; lap joints at least 2 inches (51mm) and seal with plastic cement; secure with nails.

3.4 INSTALLATION OF STARTER SHINGLES

A. General:

1. Install in accordance with Manufacturer's instructions and local building codes. When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.
2. Refer to application instructions for the selected starter strip shingles.

B. Placement and Nailing:

1. For maximum wind resistance along rakes & eaves, install any GAF starter strip containing sealant or cement shingles to underlayment and each other in a 4" (102mm) width of asphalt plastic roof cement.
2. Place starter strip shingles 1/4" – 3/4" (6 – 19mm) over eave and rake edges to provide drip edge.
3. Nail approximately 1-1/2" – 3" (38 – 76mm) above the butt edge of the shingle.
4. Rake starter course should overlap eave edge starter strip at least 3" (76mm).

3.5 INSTALLATION OF SHINGLES

A. General:

1. Install in accordance with Manufacturer's instructions and local building codes. When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.
2. Minimize breakage of shingles by avoiding dropping bundles on edge, by separating shingles carefully (not by "breaking" over ridge or bundles), and by taking extra precautions in temperatures below 40 degrees F (4 degrees C).
3. Handle carefully in hot weather to avoid scuffing the surfacing, or damaging the shingle edges.

B. Placement and Nailing:

1. Secure with 4, 5, or 6 nails per shingle per Manufacturer's application instructions or local codes.
2. Placement of nails varies based on the type of shingle specified. Consult the application instructions for the specified shingle for details.
3. Nails must be driven flush with the shingle surface. Do not overdrive or under drive the nails.
4. Shingle offset varies based on the type of shingle specified. Consult the application instructions for the specified shingle for details.

C. Valleys:

1. Install valleys using the "closed cut valley" method:
 - a. Run the first course of shingles from the higher roof slope across the valley at least 12 inches (305mm).
 - b. Run succeeding courses of shingles from the lower roof slope across the valley at least 12 inches (305mm) and nail not closer than 6 inches (152mm) to center of valley.
 - c. Run shingles from the upper roof slope into the valley and trim 2 inches (51mm) from the center line.

D. Penetrations

1. All Penetrations are to be flashed according to GAF, ARMA and NRCA application instructions and construction details.

3.6 INSTALLATION OF ATTIC VENTILATION

A. General:

1. Ventilation must meet or exceed current F.H.A., H.U.D. and local code requirements.

B. Ridge / Soffit ventilation:

1. Install ridge vent along the entire length of ridges:
2. Cut continuous vent slots through the sheathing, stopping 6 inches (152mm) from each end of the ridge.
3. On roofs without ridge board, make a slot 1 inch (25mm) wide, on either side of the peak (2 inch (51mm) overall).
4. On roofs with ridge board, make two slots 1-3/4 inches (44.5mm) wide, one on each side of the peak (3 ½ inch (89mm) overall).
5. Install ridge vent material along the full length of the ridge, including uncut areas.
6. Butt ends of ridge vent material and join using roofing cement.
7. Install eaves vents in sufficient quantity to equal or exceed the ridge vent area.

3.7 PROTECTION

- #### A. Protect installed products from foot traffic until completion of the project.

- #### B. Any roof areas that are not completed by the end of the workday are to be protected from moisture and contaminants.

END OF SECTION 07 31 12

SECTION 07 46 00 – SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY

- A. Section Includes:
 - 1. Fiber-cement siding.
 - 2. Fiber-cement soffit.
 - 3. Extruded aluminum trim and vents.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: For siding and soffit including related accessories.
- C. Samples for Verification: For each type, color, texture, and pattern required.
 - 1. 12-inch- long-by-actual-width Sample of siding.
 - 2. 12-inch- long-by-actual-width Sample of soffit.
 - 3. 12-inch- long-by-actual-width Samples of trim and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of siding and soffit, from manufacturer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.
- C. Research/Evaluation Reports: For each type of siding required, from the ICC.
- D. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of siding and soffit and related accessories to include in maintenance manuals.

1.6 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. Furnish full lengths of siding and soffit including related accessories, in a quantity equal to 2 percent of amount installed.

1.7 QUALITY ASSURANCE

- A. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- B. Source Limitations: Obtain siding and soffit, including related accessories, from single source from single manufacturer.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups for siding and soffit including accessories.
 - a. Size: 48 inches long by 60 inches high.
 - b. Include outside corner on one end of mockup and inside corner on other end.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in a dry, well-ventilated, weathertight place.

1.9 COORDINATION

- A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.10 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace siding and soffit that fail(s) in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracking, deforming.
 - 2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT SIDING

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Cemplank.
 - b. CertainTeed Corp.
 - c. James Hardie.
2. Horizontal Pattern: Boards 7.25 inches, as indicated on the Drawings, wide in plain style.
 - a. Texture: Smooth.
 3. Factory Priming: Manufacturer's standard acrylic primer.

2.2 FIBER-CEMENT SOFFIT

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cemplank.
 - b. CertainTeed Corp.
 - c. James Hardie.
- B. Pattern: 24-inch wide sheets with smooth texture.
- C. Ventilation: Provide perforated soffit unless otherwise indicated.
- D. Factory Priming: Manufacturer's standard acrylic primer.

2.3 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
 1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.
- B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:
 1. Door and window casings.
 2. Entrance and window head pediments.
 3. Fasciae.
 4. Moldings and trim.
- C. Colors for Decorative Accessories: Match adjacent siding.
- D. Flashing: Provide stainless-steel flashing complying with Division 07 Section "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
- E. Fasteners:
 1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
 2. For fastening fiber cement, use stainless-steel fasteners.

- F. Insect Screening for Soffit Vents: Stainless steel, 18-by-18 mesh.
- G. Continuous Soffit Vents: Aluminum, hat-channel shape, with perforations; 2 inches wide and not less than 96 inches long.
 - 1. Net-Free Area: 6 sq. in./linear ft.
 - 2. Finish: Mill finish
- H. Aluminum Trim and Reveals: Extruded accessories of profiles and dimensions indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 - 3. Finish: Clear anodized, Class II.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding and soffit and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

- A. General: Comply with siding and soffit manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Do not install damaged components.
 - 2. Install fasteners no more than 16 inches o.c.
- B. Install fiber-cement siding and soffit and related accessories.
 - 1. Install fasteners no more than 16 inches o.c.
- C. Install joint sealants as specified in Division 07 Section "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07 46 00

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Formed Products:
 - a. Formed roof drainage sheet metal fabrications.
 - b. Formed steep-slope roof sheet metal fabrications.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
 - 1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft.: 60-lbf/sq. ft. perimeter uplift force, 90-lbf/sq. ft. corner uplift force, and 30-lbf/sq. ft. outward force.
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 4. Details of termination points and assemblies, including fixed points.
 - 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.

6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 7. Details of special conditions.
 8. Details of connections to adjoining work.
 9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified fabricator.
- B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Preinstallation Conference: Conduct conference at Project site.
 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 2. Review methods and procedures related to sheet metal flashing and trim.
 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.8 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Restricted flatness 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. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
 - 2. Surface: Smooth, flat.
 - 3. Exposed Coil-Coated Finish, provide one of the following as selected by Architect:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - c. Mica Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - d. Metallic Fluoropolymer: AAMA 621. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

4. Color: As selected by Architect from manufacturer's full range.
5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- B. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- H. Do not use graphite pencils to mark metal surfaces.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
1. Gutter Style: SMACNA designation A, modified.
 2. Expansion Joints: Lap type.
 3. Accessories: Continuous removable leaf screen with sheet metal frame and hardware cloth screen.
 4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch thick.
 5. Gutters with Girth 16 to 20 Inches: Fabricate from the following materials:
 - a. Galvanized Steel: 0.028 inch thick.
 6. Gutters with Girth 21 to 25 Inches: Fabricate from the following materials:
 - a. Galvanized Steel: 0.034 inch thick.
 7. Gutters with Girth 26 to 30 Inches: Fabricate from the following materials:
 - a. Galvanized Steel: 0.040 inch thick.
 8. Gutters with Girth 31 to 35 Inches: Fabricate from the following materials:
 - a. Galvanized Steel: 0.052 inch thick.
- B. Downspouts: Fabricate round downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
1. Downspout Style: SMACNA designation 1-32D.
 2. Fabricated Hanger Style: SMACNA figure designation 1-35D
 3. Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch thick.

2.6 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Drip Edges: Fabricate from the following materials:
 1. Galvanized Steel: 0.022 inch thick.
- B. Eave and Rake Flashing: Fabricate from the following materials:
 1. Galvanized Steel: 0.022 inch thick.
- C. Counterflashing: Fabricate from the following materials:
 1. Galvanized Steel: 0.022 inch thick.
- D. Flashing Receivers: Fabricate from the following materials:
 1. Galvanized Steel: 0.022 inch thick.
- E. Roof-Penetration Flashing: Fabricate from the following materials:
 1. Galvanized Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Install underlayment as indicated on Drawings.
- B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 - 5. Install sealant tape where indicated.
 - 6. Torch cutting of sheet metal flashing and trim is not permitted.
 - 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
 - 1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Seal joints as shown and as required for watertight construction.
 - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 1. Loosely lock straps to front gutter bead and anchor to roof deck.
 - 2. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
 - 3. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
 - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
 - 2. Connect downspouts to underground drainage system indicated.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

- B. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8- inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING AND PROTECTION

- A. Clean off excess sealants.
- B. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- C. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
 - 3. Penetrations in smoke barriers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
 - 1. For penetration firestopping sealants and sealant primers, documentation including printed statement of VOC content.
 - 2. For penetration firestopping sealants and sealant primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
- C. Notify testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. A/D Fire Protection Systems Inc.
 2. Grace Construction Products.
 3. Hilti, Inc.
 4. Johns Manville.
 5. Nelson Firestop Products.
 6. NUCO Inc.
 7. Passive Fire Protection Partners.
 8. RectorSeal Corporation.
 9. Specified Technologies Inc.
 10. 3M Fire Protection Products.
 11. Tremco, Inc.; Tremco Fire Protection Systems Group.
 12. USG Corporation.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions.
 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Horizontal assemblies include floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

- E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- H. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- I. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.

3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 84 13

SECTION 07 84 46 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Joints in or between fire-resistance-rated constructions.
 - 2. Joints in smoke barriers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
 - 1. For fire-resistive joint system sealants, documentation including printed statement of VOC content.
 - 2. For fire-resistive joint system sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
 - 1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- B. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
 - 1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
 - a. Fire-resistive joint system products bear classification marking of qualified testing agency.
 - b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.01 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A/D Fire Protection Systems Inc.
 - b. CEMCO.
 - c. Fire Trak Corp.
 - d. Grace Construction Products.
 - e. Hilti, Inc.
 - f. Johns Manville.
 - g. Nelson Firestop Products.
 - h. NUCO Inc.
 - i. Passive Fire Protection Partners.
 - j. RectorSeal Corporation.
 - k. Specified Technologies Inc.
 - l. 3M Fire Protection Products.
 - m. Tremco, Inc.; Tremco Fire Protection Systems Group.
 - n. USG Corporation.
- C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.
1. L-Rating: Not exceeding 5.0 cfm/ft of joint at 0.30 inch wg at both ambient and elevated temperatures.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A/D Fire Protection Systems Inc.
 - b. Grace Construction Products.
 - c. Hilti, Inc.
 - d. Johns Manville.
 - e. Nelson Firestop Products.
 - f. NUCO Inc.
 - g. Passive Fire Protection Partners.
 - h. RectorSeal Corporation.
 - i. Specified Technologies Inc.
 - j. 3M Fire Protection Products.
 - k. Tremco, Inc.; Tremco Fire Protection Systems Group.

- I. USG Corporation.
- D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- F. Low-Emitting Materials: Fire-resistive joint system sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small- Scale Environmental Chambers."
- G. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

- C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 07 84 46

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Urethane joint sealants.
 - 2. Latex joint sealants.
 - 3. Acoustical joint sealants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Sustainable Design Submittals:
 - 1. For sealants and sealant primers used inside the weatherproofing system, documentation including printed statement of VOC content.
 - 2. For sealants and sealant primers used inside the weatherproofing system, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small- Scale Environmental Chambers."
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 - 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

E. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 URETHANE JOINT SEALANTS

- A. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; Dynatrol II.
 - b. Polymeric Systems, Inc.; PSI-270.
 - c. Tremco Incorporated; Dymeric 240.

B. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Sonolastic NP 2.
 - b. LymTal International, Inc.; Iso-Flex 885 SG.
 - c. May National Associates, Inc.; Bondaflex PUR 2 NS.
 - d. Pacific Polymers International, Inc.; Elasto-Thane 227 High Shore Type II.
 - e. Pecora Corporation; Dynatred.
 - f. Sika Corporation, Construction Products Division; Sikaflex - 2c NS.
 - g. Tremco Incorporated; Vulkem 227.

2.3 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Sonolac.
 - b. Bostik, Inc.; Chem-Calk 600.
 - c. May National Associates, Inc.; Bondaflex 600.
 - d. Pecora Corporation; AC-20+.
 - e. Schnee-Morehead, Inc.; SM 8200.
 - f. Tremco Incorporated; Tremflex 834.

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; AC-20 FTR.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.

2.5 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin).

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.

- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

- G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Standard hollow metal doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.
- C. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Other Action Submittals:
 - 1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.
- D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amweld Building Products, LLC.
 2. Benchmark; a division of Therma-Tru Corporation.
 3. Ceco Door Products; an Assa Abloy Group company.
 4. Curries Company; an Assa Abloy Group company.
 5. Mesker Door Inc.
 6. Metal Products, Incorporated.
 7. Steelcraft; an Ingersoll-Rand company.
 8. Windsor Republic Doors.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

- I. Glazing: Comply with requirements in Division 08 Section "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15- mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Design: Panel Embossed.
 - 2. Core Construction: Manufacturer's standard polystyrene, polyurethane, polyisocyanurate, or mineral-board core.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - 1) Thermally Rated Door Assemblies: Provide door assemblies with U- factor of not more than 0.38 deg Btu/F x h x sq. ft. (2.16 W/K x sq. m) when tested according to ASTM C 518.
 - 2) Locations: Exterior doors, unit entry doors, and interior doors where indicated.
 - 3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
 - 4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
 - 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as full profile welded unless otherwise indicated.
 - 3. Frames for Level 3 Steel Doors: 0.053-inch- thick steel sheet.

- C. Interior Frames: Fabricated from cold-rolled steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate knocked-down, drywall slip-on frames for existing partitions
 - 3. Fabricate frames as full profile welded unless otherwise indicated.
 - 4. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
 - 5. Frames for Wood Doors: 0.053-inch-thick steel sheet.
 - 6. Frames for Borrowed Lights: 0.053-inch- thick steel sheet.

- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.7 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.

- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Glazed Lites: Factory cut openings in doors.
 - 3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - 2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

- 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 - 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDIA250.8.
 - 2. Reinforce doors and frames to receive nontemplated, mortised and surface- mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.9 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.

- b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 5. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 7. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3. Smoke-Control Doors: Install doors according to NFPA 105.

- D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

SECTION 08 16 00 – COMPOSITE DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Passage Doors for inside living units.

1.2 REFERENCES

- A. National Fire Protection Association (NFPA): NFPA 252: Standard Methods of Fire Tests of Door Assemblies.
- B. Underwriters Laboratories, Inc. (UL): UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies.

1.3 DESIGN REQUIREMENTS

- A. Fire-Rated Door Assemblies: Fire door assemblies shall meet or exceed fire-protection ratings indicated when tested in accordance with UL 10C.

1.4 SUBMITTALS

- A. Product Data: Submit door manufacturer current product literature, including installation instruction.
 - 1. Samples: Provide finish samples for all products.
 - 2. Quality Assurance Submittals:
 - 3. Manufacturer Instructions: Provide manufacturer's written installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver doors, materials and components in manufacturer's original, unopened, damaged containers with identification labels intact.
- B. Store doors as recommended by manufacturer.

1.6 WARRANTY

- A. Manufacturer standard warranty indicating that the door will be free from material and workmanship defects from the date of substantial completion for the time periods indicated below:
 - 1. Door Unit: 5 years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Flush Composite Doors:

1. JELD-WEN Interior Doors; 3305 Lakeport Blvd; Klamath Falls, OR 97601, USA; Phone 877.535.3462, fax 541.882.3455; website www.jeld-wen.com.
2. Tru-Stile Doors, LLC.
3. Masonite Corporation.

2.2 COMPOSITE DOORS

A. Basis of Design: Doors are based on JELD-WEN's Pro-Core Solid Core with NAUF.

B. Core and Frame: Solid core with all-wood frame.

1. Thickness: 1-3/8 inch.
2. Jambs:
 - a. Jamb Width: 4-3/4 inch.
 - b. Jamb Type: Split.
 - c. Species: Finger-Jointed Pine.

C. Hardware Finish: Brushed chrome.

D. Prefinished Smooth: 2-ply rotary cut birch, stained with catalyzed polyurethane sealer.

1. Color: As selected by Architect from manufacturer's full range.

E. Provide bi-fold doors matching swinging doors.

PART 3 - EXECUTION

3.1 GENERAL

- #### A. Install doors in accordance with manufacturer's installation guidelines and recommendations.

3.2 EXAMINATION

A. Inspect door prior to installation.

- #### B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.3 PREPARATION

- #### A. Prepare door for installation in accordance with manufacturer's recommendations.

- B. Trim bottom of jamb sides to achieve desired distance between door bottom and finished floor height.

3.4 INSTALLATION

- A. Place door unit into opening and level hinge side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
- B. Level latch side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
- C. Verify spacing between jamb and door is uniform on all sides. Adjust as necessary.
- D. Shim top of jamb in center of opening and fasten with nail.
- E. Re-check for square, level and even spacing around door. Nail securely in place through stop, jamb, shims and into studs every 12 inches.
- F. Set nails.
- G. Install trim on both sides using nails every 12 to 16 inches.

END OF SECTION 08 16 00

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Detail fabrication and installation of access doors and frames for each type of substrate.
- C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
- D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
 - 2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Access Panel Solutions.
 - 2. Acudor Products, Inc.
 - 3. Alfab, Inc.
 - 4. Babcock-Davis.
 - 5. Cendrex Inc.
 - 6. Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
 - 7. Jensen Industries; Div. of Broan-Nutone, LLC.
 - 8. J. L. Industries, Inc.; Div. of Activar Construction Products Group.

9. Karp Associates, Inc.
10. Larsen's Manufacturing Company.
11. Maxam Metal Products Limited.
12. Metropolitan Door Industries Corp.
13. MIFAB, Inc.
14. Milcor Inc.
15. Nystrom, Inc.
16. Williams Bros. Corporation of America (The).

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Wall Access Doors:

1. Fire Rated Doors: Fire Rated Access Door, manufactured by Inryco/Milcor.
 - a. UL "B" (1-1/2 hour) Label.
 - b. Steel, prime finish.
 - c. Size as required to access equipment.
 - d. Provide key-operated cylinder lock.
 - e. Provide masonry anchors, where applicable.
2. Non-Fire Rated Doors, for gypsum board walls and partitions: Style DW, manufactured by Inryco/Milcor.
 - a. Steel, prime finish.
 - b. Size: 24" x 48".
 - c. Provide key-operated cylinder lock.

D. Ceiling Access Doors:

1. Doors: Style ATR, manufactured by Inryco/Milcor. 2. Size: 24" x 30".

2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- D. Frame Anchors: Same type as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
 - 2. Provide mounting holes in frames for attachment of units to wood framing.
 - 3. Provide mounting holes in frame for attachment of masonry anchors.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
 - 1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For cylinder locks, furnish two keys per lock and key all locks alike.
 - 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
 - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate- free, universal primer immediately after surface preparation and pretreatment.
 - 2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil for topcoat.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

SECTION 08 53 13 - VINYL WINDOWS

PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and color Samples.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. CertainTeed Corporation.
 2. Jeld-Wen, Inc.
 3. Kolbe & Kolbe Millwork Co., Inc.
 4. Pella Corporation.
 5. Weather Shield Mfg., Inc.
 6. YKK AP America Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Product Standard: AAMA/WDMA/CSA 101/I.S.2/A440.
 1. Window Certification: WDMA certified with label attached to each window.
 2. Performance Class: LC.
 3. Performance Grade: 30.
- B. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.31 Btu/sq. ft. x h x deg F.
- C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30.

2.3 VINYL WINDOWS

- A. Window Types: As indicated on Drawings.
- B. Window Color: As selected by Architect from manufacturer's full range.
- C. Equip units with removable grilles as indicated; attach to inside face of each lite.
- D. Trim: Provide indicated trim, matching material and finish of frame members.
- E. Provide stainless-steel, ball-bearing sash rollers with nylon tires for sliding windows.
- F. Equip units with vinyl-coated, glass-fiber mesh insect screens at operable sashes.

- G. Glaze units with low-E-coated, argon-filled, sealed insulating glass, complying with Section 08 80 00 "Glazing."

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Set units level, plumb, and true to line, without warp or rack of frames and panels. Provide proper support and anchor securely in place.
- B. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- C. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.
- D. Adjust operating panels, screens, and hardware to provide a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- E. Clean glass and vinyl surfaces immediately after installing windows. Remove nonpermanent labels from glass surfaces.

END OF SECTION 08 53 13

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Folding doors.
 - 2. Cylinders for door hardware specified in other Sections.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Other Action Submittals:
 - 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - c. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Fastenings and other pertinent information.
 - 5) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 6) Mounting locations for door hardware.
 - 7) List of related door devices specified in other Sections for each door and frame.
 - 2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.4 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. Door Hardware:
 - a. Provide one of each type of lock and latchset.
 - b. Provide one of each deadbolt.
 - c. Provide 200 key blanks.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- C. Source Limitations: Obtain each type of door hardware from a single manufacturer.
- D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- E. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.
- F. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- G. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, ICC/ANSI A117.1, and HUD's "Fair Housing Accessibility Guidelines".

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

H. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Requirements for access control.
5. Address for delivery of keys.

I. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Review required testing, inspecting, and certifying procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to Owner by registered mail or overnight package service.

1.7 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
 - a. Manual Closers: 10 years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA designations referenced.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
 - 2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.]
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bommer Industries, Inc.
 - b. Hager Companies.
 - c. McKinney Products Company; an ASSA ABLOY Group company.
 - d. PBB, Inc.
 - e. Stanley Commercial Hardware; Div. of The Stanley Works.

2.3 SELF-CLOSING HINGES AND PIVOTS

- A. Self-Closing Hinges and Pivots: BHMA A156.17.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Baldwin Hardware Corporation.
 - b. Bommer Industries, Inc.
 - c. Hager Companies.
 - d. McKinney Products Company; an ASSA ABLOY Group company.
 - e. PBB, Inc.
 - f. Stanley Commercial Hardware; Div. of The Stanley Works.

2.4 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Bored Locks: Minimum 1/2-inch (13-mm) latchbolt throw.
 - 2. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
 - 3. Deadbolts: Minimum 1-inch bolt throw.
- C. Lock Backset: 2-3/4 inches, unless otherwise indicated.
- D. Lock Trim:
 - 1. Description: Levers matching Omega design as manufactured by Schlage.
 - 2. Levers: Cast.
 - 3. Escutcheons (Roses): Wrought.
 - 4. Dummy Trim: Match lever lock trim and escutcheons.
 - 5. Operating Device: Lever with escutcheons (roses).
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

- F. Bored Locks: BHMA A156.2; Grade 1 and 2 as scheduled; Series 4000.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Best Access Systems; Div. of Stanley Security Solutions, Inc.
 - b. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - c. Schlage Commercial Lock Division; an Ingersoll-Rand company.
 - d. Yale Security Inc.; an ASSA ABLOY Group company.

- G. Roller Latches: BHMA A156.16; Grade 1; rolling plunger that engages socket or catch, with adjustable roller projection.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Builders Hardware Mfg., Inc.
 - b. Baldwin Hardware Corporation.
 - c. Don-Jo Mfg., Inc.
 - d. Door Controls International, Inc.
 - e. IVES Hardware; an Ingersoll-Rand company.
 - f. Rockwood Manufacturing Company.
 - g. Stanley Commercial Hardware; Div. of The Stanley Works.

2.5 AUXILIARY LOCKS

- A. Bored Auxiliary Locks: BHMA A156.5: Grade 2; with strike that suits frame.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Best Access Systems; Div. of Stanley Security Solutions, Inc.
 - b. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - c. Schlage Commercial Lock Division; an Ingersoll-Rand company.
 - d. Yale Security Inc.; an ASSA ABLOY Group company.

2.6 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 - 1. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
 - 2. Keyed Alike: Key all cylinders to same change key.

- B. Keys: Brass.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."
 - 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Master Keys: Five.
 - b. Grand Master Keys: Five.

2.7 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Key Boxes and Cabinets.
 - b. GE Security, Inc.
 - c. HPC, Inc.
 - d. Lund Equipment Co., Inc.
 - e. MMF Industries.
 - f. Tri Palm International.
 - 2. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

2.8 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. LCN Closers; an Ingersoll-Rand company.
 - b. Norton Door Controls; an ASSA ABLOY Group company.
 - c. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
 - d. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - e. Yale Security Inc.; an ASSA ABLOY Group company.

2.9 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Builders Hardware Mfg., Inc.
 - b. Baldwin Hardware Corporation.
 - c. Burns Manufacturing Incorporated.
 - d. Cal-Royal Products, Inc.
 - e. Don-Jo Mfg., Inc.
 - f. Door Controls International, Inc.
 - g. Hager Companies.
 - h. Hiawatha, Inc.
 - i. IVES Hardware; an Ingersoll-Rand company.
 - j. Rockwood Manufacturing Company.
 - k. Stanley Commercial Hardware; Div. of The Stanley Works.

- I. Trimco.

2.10 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. M-D Building Products, Inc.
 - c. National Guard Products.
 - d. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
 - e. Reese Enterprises, Inc.
 - f. Sealeze; a unit of Jason Incorporated.
 - g. Zero International.

2.11 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products.
 - c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
 - d. Reese Enterprises, Inc.
 - e. Zero International.

2.12 FOLDING DOOR HARDWARE

- A. Sliding Door Hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cox, Arthur, & Sons, Inc.
 - b. Hager Companies.
 - c. Henderson, PC Inc.
 - d. Johnson, L. E., Products, Inc.
 - e. Stanley Commercial Hardware; Div. of The Stanley Works.

2.13 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Baldwin Hardware Corporation.
 - b. Cal-Royal Products, Inc.
 - c. Don-Jo Mfg., Inc.

- d. Hager Companies.
- e. Rockwood Manufacturing Company.
- f. Stanley Commercial Hardware; Div. of The Stanley Works.
- g. Trimco.

2.14 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
 - 3. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
 - 4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.15 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

- D. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- H. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 - 2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.
- D. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.6 DOOR HARDWARE SCHEDULE

- A. For each opening where scheduled, provide the following:

Hardware Set No. 1 Each

to have:

3	Hinges	Hager BB1279, 4.5" X 4.5", US26D
1	Passage Set	Schlage ND10S – Omega, US26D
1	Door Closer	LCN 4011/4111 X Sprayed Aluminum
1	Door Stop	Hager 236W OR 241F, US26D
1	Threshold	NGP 884V
1	Weather-strip	NGP 127NA – HEAD & JAMBS

Hardware Set No. 2 Each

to have:

6	Hinges	Hager BB1263 – 4.5" x 4.5", US26D
2	Auto Flush Bolts	Hager 296W US26D
1	Dust Proof Strike	Hager 280X US26D
1	Storeroom Set	Schlage ND80PM – Omega, US26D
1	Latch Protector	Don-Jo LP-111, US32D
2	Silencers	Ives SR64

Hardware Set No. 3: Each

to have:

2	Spring Hinges	Hager 1250, 4.5.x 4.5, US26D
1	Hinge	Hager BB1279, 4.5 x 4.5, US26D
1	Passage Set	Schlage AL10S, Omega, US26D
1	Deadbolt	Schalge BC160P,US26D
1	Viewer	Rockwood 622, US26D
1	Threshold	NGP 425, Mill.
1	Door Sweep	NGP 112N
1 set	Weatherstripping	NGP 5050, L.A.R.
1	Door Stop	

Hardware Set No. 4 Each

to have:

3	Hinges	Coordinate with door supplier
1	Passage Set	Schlage AL10S, Omega, US26D
1	Door Stop	Rockwood 525

Hardware Set No. 5 Each

to have:

1 set	Folding Door Hardware	L.E. Johnson FS100 Series, Length as required.
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Hardware Set No. 6 Each

to have:

3	Hinges	Coordinate with door supplier
1	Privacy Set	Schalge AL40S, Omega, US26D
1	Door Stop	Rockwood 525

Hardware Set No. 7 Each

to have:

- 3 Hinges
- 1 Lockset
- 1 Door Stop

Coordinate with door supplier
Schlage AL53PD, Omega US26D
Rockwood 525

Hardware Set No. 8 Each

to have:

- 6 Hinges
- 2 Dummy Trim
- 2 Roller Latches
- 2 Door Stops

Coordinate with door supplier
Schlage AL170, Neptune, US26D
Rockwood 594

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

- A. Submittals: Product Data and Samples.
- B. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated.
 - 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
 - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 - 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- C. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- D. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.
- E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

PART 2 - PRODUCTS

2.1 GLASS, GENERAL

- A. Fire-Resistance-Rated Assemblies: Provide products that comply with NFPA 80 and are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for applications indicated.
- B. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201. Provide safety glazing labeling where safety glass is indicated.

2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3.

- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3.
- C. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials.
- D. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

2.3 MONOLITHIC-GLASS TYPES

- A. Glass: Clear float glass.
 - 1. Provide fully tempered float glass where indicated or required by Authorities Having Jurisdiction.
 - 2. Thickness: 6.0 mm.

2.4 INSULATING-GLASS TYPES

- A. Glass Type: Low-e-coated, clear insulating glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Thickness of Each Glass Lite: 6.0 mm.
 - 3. Outdoor Lite: Float glass.
 - 4. Interspace Content: Argon.
 - 5. Indoor Lite: Float glass.
 - 6. Visible Light Transmittance: 70% percent minimum.
 - 7. Winter Nighttime U-Factor: 0.29 maximum.
 - 8. Summer Daytime U-Factor: 0.28 maximum.
 - 9. Solar Heat Gain Coefficient: 0.38. maximum.

2.5 GLAZING SEALANTS

- A. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Products: One of the following:
 - a. Dow Corning Corporation; 799.
 - b. GE Advanced Materials - Silicones; UltraGlaze SSG4000.
 - c. May National Associates, Inc.; Bondaflex Sil 200 GPN.
 - d. Polymeric Systems, Inc.; PSI-631.
 - e. Schnee-Morehead, Inc., an ITW company; SM5731 Poly-Glaze Plus.
 - f. Tremco Incorporated; Proglaze SSG.
- B. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.
- C. Low-Emitting Materials: Sealants shall have a VOC content of not more than 250 g/L. PART

3 - EXECUTION

3.01 INSTALLATION

- A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are contained in GANA's "Glazing Manual."
- B. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- C. Remove nonpermanent labels, and clean surfaces immediately after installation.

END OF SECTION 08 80 00

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - 3. For adhesives used to laminate gypsum board panels to substrates, documentation including printed statement of VOC content.
 - 4. For adhesives used to laminate gypsum board panels to substrates, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small- Scale Environmental Chambers."
- C. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.3 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small- Scale Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one- half of preconsumer recycled content not less than 25 percent.
- B. Regional Materials: Gypsum panel products shall be manufactured within 500 miles of Project site.

- C. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corp.
 - 3. Georgia-Pacific Gypsum LLC.
 - 4. Lafarge North America Inc.
 - 5. National Gypsum Company.
 - 6. PABCO Gypsum.
 - 7. Temple-Inland.
 - 8. USG Corporation.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- D. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
 - 1. Thickness: 1/4 inch.
 - 2. Long Edges: Tapered.
- E. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- F. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: As indicated.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper- faced galvanized steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.

- f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
 - 4. Provide factory-formed corner and tee sections.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
- 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
- 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
- 1. Configuration: Asymmetrical.
 - 2. Minimum Base-Metal Thickness: 0.018 inch.

- C. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- D. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112-inch thick, or wood members.

- E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 - 2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 percent.

- F. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - b. Grabber Construction Products; Acoustical Sealant GSC.
 - c. Pecora Corporation; AC-20 FTR.
 - d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - e. USG Corporation; SHEETROCK Acoustical Sealant.
 - 2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 3. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- G. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."

- H. Vapor Retarder: As specified in Section 07 21 00 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840 and ASTM C 754.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: As indicated on Drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drillscrews.
- C. Multilayer Application:
 - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints [at locations indicated on Drawings] [according to ASTM C 840 and in specific locations approved by Architect for visual effect].
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where indicated.
 4. U-Bead: Use at exposed panel edges.
 5. Curved-Edge Cornerbead: Use at curved openings.
 6. Cornerbead: Use at outside corners.
 7. LC-Bead: Use at exposed panel edges.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated
 - a. Primer and its application to surfaces are specified in other Section 09 91 00 "Interior Painting." Level 5 is suitable for surfaces receiving gloss and semigloss enamels and other surfaces subject to severe lighting. It is considered a high-quality gypsum board finish.
 3. Level 5: Ceilings.
 - a. Primer and its application to surfaces are specified in other Section 09 91 00 "Interior Painting."

3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

- A. Submittals: Product data and Samples.
- B. Obtain tile of each type and color or finish from same production run for each contiguous area.
- C. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling ceramic tile packages.

PART 2 - PRODUCTS

2.1 CERAMIC TILE

- A. Ceramic tile that complies with ANSI A137.1.
- B. Ceramic Tile: As selected by Architect.

2.2 INSTALLATION MATERIALS

- A. Setting and Grouting Materials: Comply with material standards in ANSI's "Specifications for the Installation of Ceramic Tile" that apply to materials and methods indicated.
 - 1. Thinset Mortar Type: Modified dry-set, ANSI A118.4 mortar; white, unless otherwise indicated.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Boiardi Products Corporation; a QEP company.
 - 2) Bonsal American, an Oldcastle company.
 - 3) Bostik, Inc.
 - 4) C-Cure.
 - 5) Custom Building Products.
 - 6) H.B. Fuller Construction Products Inc. / TEC.
 - 7) Jamo Inc.
 - 8) LATICRETE SUPERCAP, LLC.
 - 9) MAPEI Corporation.
 - 10) Southern Grouts & Mortars, Inc.
 - 11) Summitville Tiles, Inc.
 - 2. Grout Type: High-performance tile grout, ANSI A118.7.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) ARDEX Americas.
 - 2) Boiardi Products Corporation; a QEP company.
 - 3) Bonsal American, an Oldcastle company.
 - 4) Bostik, Inc.

- 5) C-Cure.
- 6) Custom Building Products.
- 7) H.B. Fuller Construction Products Inc. / TEC.
- 8) Jamo Inc.
- 9) LATICRETE SUPERCAP, LLC.
- 10) MAPEI Corporation.
- 11) Southern Grouts & Mortars, Inc.
- 12) Summitville Tiles, Inc.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, are specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight, aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- C. Lay tile in grid pattern unless otherwise indicated. Align joints where adjoining tiles on floor, base, walls, and trim are the same size.
- D. Interior Floor Tile Installation Method(s):
 1. Over Concrete Subfloors: TCNA F113; thinset mortar.

END OF SECTION 09 30 13

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient stair accessories.
 - 3. Resilient molding accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
 - 1. For adhesives, documentation including printed statement of VOC content.
 - 2. For adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.
- E. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.3 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. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq.cm.
- B. Mockups: Provide resilient products with mockups specified in other Sections.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

- A. Resilient Base:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allstate Rubber Corp.; Stoler Industries.
 - b. Armstrong World Industries, Inc.
 - c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - d. Endura Rubber Flooring; Division of Burke Industries, Inc.
 - e. Flexco, Inc.
 - f. Johnsonite.
 - g. Musson, R. C. Rubber Co.
 - h. Roppe Corporation, USA.
- B. Resilient Base Standard: ASTM F 1861.
 - 1. Material Requirement: Type TS (rubber, vulcanized thermoset).
 - 2. Manufacturing Method: Group I (solid, homogeneous).
 - 3. Style: Cove (base with toe).
- C. Minimum Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed or preformed.

- G. Inside Corners: Job formed or preformed.
- H. Finish: As selected by Architect from manufacturer's full range.
- I. Colors and Patterns: As selected by Architect from manufacturer's full range of colors.

2.2 RESILIENT STAIR ACCESSORIES

A. Resilient Stair Treads:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allstate Rubber Corp.; Stoler Industries.
 - b. Armstrong World Industries, Inc.
 - c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - d. Endura Rubber Flooring; Division of Burke Industries, Inc.
 - e. Flexco, Inc.
 - f. Johnsonite.
 - g. Musson, R. C. Rubber Co.
 - h. Roppe Corporation, USA.

B. Resilient Stair Treads Standard: ASTM F 2169.

- 1. Material Requirement: Type TS (rubber, vulcanized thermoset).
- 2. Surface Design:
 - a. Class 1, Smooth (flat).
 - b. Class 2, Pattern: Raised-square design.
- 3. Manufacturing Method: Group 1, tread with embedded abrasive strips.

C. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.

D. Nosing Height: 1-1/2 inches.

E. Thickness: 1/4 inch and tapered to back edge.

F. Size: Lengths and depths to fit each stair tread in one piece.

G. Risers: Smooth, flat, coved-toe, 7 inches high by length matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

- 1. Thickness: 0.080 inch.

H. Colors and Patterns: As selected by Architect from manufacturer's full range of colors.

2.3 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - b. Flexco, Inc.
 - c. Johnsonite.
 - d. R.C.A. Rubber Company (The).

e. Roppe Corporation, USA.

B. Description:

1. Nosing for resilient floor covering.
2. Reducer strip for resilient floor covering.
3. Transition strips.

C. Material: Rubber.

D. Profile and Dimensions: As indicated.

E. Colors and Patterns: As selected by Architect from manufacturer's full range of colors.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

D. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.

- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
 - 1. Apply three coat(s).
- E. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vinyl composition floor tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
 - 1. For adhesives, documentation including printed statement of VOC content.
 - 2. For resilient tile flooring, documentation from an independent testing agency indicating compliance with the FloorScore Standard.
 - 3. For flooring system and adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Samples for Initial Selection: For each type of floor tile indicated.
- D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MATERIALS MAINTENANCE 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. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq.cm.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockups for floor tile including resilient base and accessories.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.8 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than, in spaces to receive floor tile during the following time periods:
 1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore Standard.
- B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 VINYL COMPOSITION FLOOR TILE

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Johnsonite; a Tarkett company.
 - 3. Mannington Mills, Inc
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.
- F. Colors and Patterns: As selected by Architect from manufacturer's full range of colors and patterns.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
 - 1. Adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. VCT and Asphalt Tile Adhesives: Not more than 50 g/L.
 - b. Rubber Floor Adhesives: Not more than 60 g/L.
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer[and as follows]. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floortile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles in pattern indicated.

- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floortile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply three coat(s).
- E. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 90 00 - PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation and field painting of exposed interior items and surfaces.
- B. Surface preparation and field painting of exposed exterior items and surfaces.
- C. Painting of exposed bare and covered pipes and ducts, hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM) D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- B. Steel Structures Painting Council (SSPC) SP6 - Commercial Blast Cleaning Procedures.
- C. Steel Structures Painting Council (SSPC) SP10 - Near White Blast Cleaning Procedure.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85 degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60 degree meter.
 - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60 degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60 degree meter.
- B. Environments: The following terms distinguish between different corrosive exposures:
 - 1. "Severe environments" are highly corrosive industrial atmospheres with sustained exposure to high humidity and condensation and with frequent cleaning using strong chemicals. Environments with heavy concentrations of strong chemical fumes and frequent splashing and spilling of harsh chemical products are severe environments.

2. "Moderate environments" are corrosive industrial atmospheres with intermittent exposure to high humidity and condensation, occasional mold and mildew development, and regular cleaning with strong chemicals. Environments with exposure to heavy concentrations of chemical fumes and occasional splashing and spilling of chemical products are moderate environments.
3. "Mild environments" are industrial atmospheres with normal exposure to moderate humidity and condensation, occasional mold and mildew development, and infrequent cleaning with strong chemicals. Environments with low levels of mild chemical fumes and occasional splashing and spilling of chemical products are mild environments. Normal outdoor weathering is also considered a mild environment.

1.4 SUBMITTALS

- A. Product Data: For each paint system indicated, including:
 1. Material List: An inclusive list of required coating materials. Indicate each material and cross reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Preparation instructions and recommendations.
 3. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual experienced in applying paints and coatings 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.
- B. Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Paint exposed surfaces. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
- D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 1. Finish areas designated by Architect.
 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label:
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.

1.7 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. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).
- C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).
- D. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
- B. Quantity: Furnish Owner with an additional three percent, but not less than 1 gal(3.8 l) or 1 case, as appropriate, of each material and color applied.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 1. PPG Paints.
 2. Sherwin-Williams.
 3. Benjamin Moore & Co.
 4. Duron, Inc.

5. Glidden Professional, Division of PPG Architectural Finishes, Inc.
6. M.A.B. Paints.

2.2 PAINT MATERIALS - GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. VOC Classification: Provide high-performance coating materials, including primers, undercoats, and finish-coat materials, that meet the applicable local, state or federal VOC requirements.
- C. Color: Refer to Finish Schedule and Paint Legend for paint colors.

2.3 INTERIOR PAINT SYSTEMS

A. CONCRETE:

1. Latex Systems:

a. Semi-Gloss Finish:

- 1) 1st Coat: Benjamin Moore Super Spec Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
- 2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, X-Green 147, 141, X-Green 141, LEED 2009, LEED V4.
- 3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, X-Green 147, 141, X-Green 141, LEED 2009, LEED V4.

B. MASONRY:

1. Latex Systems:

a. Semi-Gloss Finish High Performance:

- 1) 1st Coat: Benjamin Moore Super Spec Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
- 2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
- 3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.

C. METAL: Aluminum, Galvanized.

1. Latex Systems:

a. Semi-Gloss High Performance:

- 1) 1st Coat: Benjamin Moore Super Spec HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.

- 2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
- 3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.

D. METAL: Galvanized; Ceilings, Ductwork.

1. Dryfall Waterborne Topcoats:
 - a. Flat Finish:
 - 1) 1st Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.
 - 2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.

E. METAL:

1. Latex Systems:
 - a. 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
 - b. 2nd Coat: Corotech Acrylic DTM Enamel Semi-Gloss V331 (204 g/L), MPI # 153.
 - c. 3rd Coat: Corotech Acrylic DTM Enamel Semi-Gloss V331 (204 g/L), MPI # 153.
2. Dryfall Waterborne Topcoats:
 - a. Flat Finish:
 - 1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
 - 2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.
 - 3) 3rd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.

F. WOOD:

1. Latex Systems:
 - a. Semi-Gloss Finish:
 - 1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
 - 2) 2nd Coat: Coronado Rust Scat Waterborne Acrylic Semi-Gloss 90 (134 g/L), MPI # 153, LEED Credit.
 - 3) 3rd Coat: Coronado Rust Scat Waterborne Acrylic Semi-Gloss 90 (134 g/L), MPI # 153, LEED Credit.
2. Stain and Varnish System:
 - a. Satin Finish:
 - 1) 1st Coat: Lenmar Waterborne Interior Wiping Stain 1WB.1300 (240 g/L), MPI # 186 LEED Credit.
 - 2) 2nd Coat: Lenmar Waterborne Aqua-Plastic Urethane Satin, 1WB.1427 (335 g/L), MPI # 121, 128.
 - 3) 3rd Coat: Lenmar Waterborne Aqua-Plastic Urethane Satin, 1WB.1427 (335 g/L), MPI # 121, 128.

G. DRYWALL:

1. Latex Systems:

a. Eggshell / Satin System:

- 1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
- 2) 2nd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009 LEED V4, CHPS Certified.
- 3) 3rd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.

2. Epoxy System:

a. Semi-Gloss System:

- 1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
- 2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
- 3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).

2.4 EXTERIOR PAINT SYSTEMS

A. FIBER CEMENT SIDING AND CONCRETE:

1. Latex Systems:

a. Satin Finish:

- 1) 1st Coat: Benjamin Moore Super Spec Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
- 2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.
- 3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.

B. MASONRY:

1. Latex Systems:

a. Satin Finish - Early Moisture Resistant Finish:

- 1) 1st Coat: Benjamin Moore Super Spec Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
- 2) 2st Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.
- 3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.

C. METAL: Aluminum, Galvanized.

1. Latex Systems:

a. Semi-Gloss Finish:

- 1) 1st Coat: Benjamin Moore Ultra Spec HP Acrylic DTM Semi-Gloss Enamel HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.
- 2) 2nd Coat: Benjamin Moore Ultra Spec HP Acrylic DTM Semi-Gloss Enamel

HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.

D. METAL: Steel, Ferrous Metal.

1. Latex Systems:

a. Semi-Gloss Finish

- 1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
- 2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
- 3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.

E. WOOD:

1. Latex Systems:

a. Semi-Gloss Finish:

- 1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
- 2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
- 3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.

2. Stain - Water Reducible Systems:

a. Semi-Transparent:

- 1) 1st Coat: Benjamin Moore Arborcoat Semi-Transparent Deck & Siding Stain N638 (92 g/L) MPI # 156.
- 2) 2nd Coat: Benjamin Moore Arborcoat Semi-Transparent Deck & Siding Stain N638 (92 g/L) MPI # 156.

F. ARCHITECTURAL PVC, PLASTIC, FIBERGLASS

1. Latex Systems:

a. Satin Finish:

- 1) 1st Coat: Insl-X Stix Waterborne Bonding Primer SXA-110 (47 g/L).
- 2) 2nd Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.
- 3) 3rd Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.

G. DRYWALL: Gypsum Board, Exterior Drywall.

1. Latex Systems:

a. Satin Finish:

- 1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
- 2) 2nd Coat: Benjamin Moore ben Exterior Low Luster 542 (45 g/l), MPI # 15.

- 3) 3rd Coat: Benjamin Moore ben Exterior Low Luster (45 g/l), MPI # 15.

2.5 COLORS

- A. Colors as selected by Architect.
- B. A maximum of 5 exterior colors, of which 2 may be deep-tone colors, will be used.
 1. Deep-tone colors will be used for 30 percent, maximum, of the surface area.
- C. A maximum of 12 interior colors, of which 3 may be deep-tone colors, will be used.
 1. Deep-tone colors will be used for 50 percent, maximum, of the surface area.
- D. A maximum of 4 colors will be used in each room or space.
- E. Architect will furnish a Color Schedule showing colors to be used and locations of use.

PART 3 - EXECUTION

3.1 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. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.
 2. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:
 - a. Confirmation of primer's suitability for expected service conditions.
 - b. Confirmation of primer's ability to be top coated with materials specified.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Provide barrier coats over incompatible primers or remove primers and reprime substrate.
 3. Cementitious Substrates: Prepare concrete, brick, concrete masonry block, and cement plaster surfaces to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces.
 - a. Use abrasive blast-cleaning methods if recommended by coating manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
 4. Wood Substrates: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Smoothly sand surfaces exposed to view and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer, before applying primer.
 - b. Immediately on delivery, prime edges, ends, faces, undersides, and backsides of wood to be coated.
 - c. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 5. Ferrous Metal Substrates: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC recommendations.
 - a. Blast-clean steel surfaces as recommended by coating manufacturer and according to SSPC-SP 10.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, solvent clean, and touch up with same primer as the shop coat.
 6. Nonferrous-Metal Substrates: Clean nonferrous and galvanized surfaces according to manufacturer's written instructions for the type of service, metal substrate, and application required.
 - a. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

- D. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
 2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
 3. Use only the type of thinners approved by manufacturer and only within recommended limits.
 4. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. General: Apply high-performance coatings according to manufacturer's written instructions.
1. Use applicators and techniques best suited for the material being applied.
 2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
 3. Coating surface treatments, and finishes are indicated in the coating system descriptions.
 4. Provide finish coats compatible with primers used.
 5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, grilles, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
- C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. The number of coats and film thickness required is the same regardless of application method.
 2. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.4 FIELD QUALITY CONTROL

- A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.

2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

- A. After completing painting, clean glass and paint spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
- C. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces.

3.7 PAINTING SCHEDULE

- A. Painting is not required in concealed areas and generally inaccessible areas, such as foundation spaces, attic spaces, furred areas, utility tunnels, pipe chases, duct shafts, and elevator shafts.
 1. Paint elevator shafts if glass-backed.
- B. Where existing work is cut, patched, or added to, paint or touch-up surfaces to match existing work as closely as possible.
- C. Where existing work is scheduled for repainting, put in condition to receive and provide good adhesion for paint.
- D. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
- E. Paint surfaces behind movable equipment and furnishings same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furnishings with prime coat only before installation of equipment.

- F. Paint exterior doors on tops, bottoms, and side edges, same as exterior face. Paint side edges of interior doors same as faces; paint tops and bottoms with prime coat only. Paint metal glazing frames the same color as door frames.
- G. When not scheduled, finish closets and storage rooms same as adjoining room or space.
- H. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
- I. Apply sealer to both sides and edges of plywood used for mounting electrical and telephone equipment, before installation.
- J. Paint exposed electric equipment in finished spaces. Electrical items to be painted include, but are not limited to, the following:
 - 1. Switchgear.
 - 2. Panelboards.
 - 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
 - 4. Conduit.
 - 5. Boxes.
- K. Paint all exterior mechanical, plumbing and fire protection equipment, prefinished or unfinished, with the exception of color anodized or flouropolymer based finished products.
- L. Paint exposed mechanical, plumbing and fire protection equipment, except prefinished items, in interior finished spaces. Mechanical items to be painted include, but are not limited to, the following:
 - 1. Uninsulated metal piping.
 - 2. Uninsulated plastic piping.
 - 3. Pipe hangers and supports.
 - 4. Tanks that do not have factory-applied final finishes.
 - 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
 - 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- M. Paint exposed ducts, hangers and supports, except prefinished items, in finished spaces.
- N. Paint interior surfaces of ducts, that are visible through grilles and louvers, to limit of sight line.
- O. Paint louvers, grilles, covers, and access panels, except prefinished items. Paint dampers to match face of grilles.

- P. Provide labeling for all fire-rated partitions above acoustical tile ceiling at 20'-0" O.C. with the following:
1. "Fire rated assembly. Seal all penetrations."

END OF SECTION 09 90 00

SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Private-use bathroom accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.6 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

2.2 PRIVATE-USE BATHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Basco, Inc.
 - 2. Bobrick Washroom Equipment, Inc.
 - 3. Franklin Brass by Liberty Hardware Manufacturing Corporation; a Masco company.
 - 4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
 - 5. Ginger; a Masco company.
 - 6. Seachrome Corporation.
 - 7. Tubular Specialties Manufacturing, Inc.
- B. Toilet Tissue Dispenser:
 - 1. Basis-of-Design Product: B-7685, manufactured by Bobrick Washroom Equipment, Inc.
 - 2. Description: Single-roll dispenser.
 - 3. Mounting: Surface mounted.
 - 4. Material and Finish: Stainless steel, No. 4 finish (satin).
- C. Shower Curtain Rod:
 - 1. Basis-of-Design Product: B-6047, manufactured by Bobrick Washroom Equipment, Inc.
 - 2. Rod Material and Finish: Stainless steel, No. 4 finish (satin).
 - 3. Flange Material and Finish: Stainless steel, No. 4 finish (satin).

D. Towel Bar:

1. Basis-of-Design Product: B-7674, manufactured by Bobrick Washroom Equipment, Inc.
2. Mounting: Flanges with concealed fasteners.
3. Length: 24 inches.
4. Material and Finish: Stainless steel, No. 4 finish (satin).

E. Folding Shower Seat:

1. Basis-of-Design Product: B-5191, manufactured by Bobrick Washroom Equipment, Inc.
2. Configuration: Rectangular seat.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).

F. Grab Bar:

1. Basis-of-Design Product: B-6806.99, manufactured by Bobrick Washroom Equipment, Inc.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

G. Mirror:

1. Basis-of-Design Product: Mirror: B-290, 24 x 36, manufactured by Bobrick Washroom Equipment, Inc.

H. Robe Hook:

1. Basis-of-Design Product: B-672, manufactured by Bobrick Washroom Equipment, Inc.

2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 28 00

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fire Extinguishers
- B. Cabinets
- C. Accessories

1.2 REGULATORY REQUIREMENTS

- A. Comply with National Fire Protection Association (NFPA) Standard No. 10, Portable Fire Extinguishers, for extinguishers and operation and maintenance data.
- B. Provide Underwriter's Laboratories (UL) listed fire extinguishers bearing mark for type, rating, and classification indicated.

1.3 SUBMITTALS

- A. Submit product data for the following:
 - 1. Extinguishers.
 - 2. Cabinets.
- B. Submit manufacturer's installation instructions.
- C. Submit under provisions of Section 01 33 00.

1.4 OPERATION AND MAINTENANCE DATA

- A. Submit manufacturer's operation and maintenance data.
- B. Include test, refill or recharge schedules, procedures, re-certification requirements.
- C. Submit under provisions of Section 01 77 00.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. One of the following:
 - 1. JL Industries, Inc.
 - 2. Amerex Corporation.
 - 3. Ansul Incorporated.
 - 4. Badger Fire Protection.

5. Buckeye Fire Equipment Company.
6. Fire End & Croker Corporation.
7. General Fire Extinguisher Corporation.
8. Kidde Fyrnetics.
9. Larsen's Manufacturing Company.
10. Modern Metal Products; Div. of Technico.
11. Moon American.
12. Potter Roemer; Div. of Smith Industries, Inc.
13. Watrous; Div. of American Specialties, Inc.

B. Substitutions: No substitutions, except under provisions of Section 01 600.

2.2 FIRE EXTINGUISHERS

A. Model Cosmic 10E, manufactured by J.L. Industries, or equivalent by other acceptable manufacturer.

B. U.L. ratings:

1. Public Spaces: 3A-40BC.
2. Units: 1A-10BC.

C. Provide one 3A-10BC extinguisher in each cabinet and where indicated as wall mounted.

D. Provide one 1A-10BC extinguisher in each unit kitchen.

2.3 CABINETS

A. Ambassador model 1012 manufactured by J.L. Industries, or equivalent by other acceptable manufacturer.

1. Trim Style: 4 RT.
2. Door Style: S21, Solid with Flush Pull Handle that is ADA Compliant.
3. Provide fire-rated cabinets where mounted in fire-rated partitions.

B. Finish:

1. Exterior door and trim: Manufacturer's Standard White.
2. Interior: Manufacturer's Standard White.

2.4 ACCESSORIES

A. Identification: Decal, vertical red lettering, FIRE EXTINGUISHER, approximately 1" high letters.

B. Fire Extinguisher Brackets: For wall mounted extinguishers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify rough openings for cabinets are correctly sized and located.

3.2 INSTALLATION

- A. Install cabinets plumb and level in wall openings. Secure rigidly in place.
- B. Securely fasten mounting brackets to structure.
- C. Distribute extinguishers and place in service.
- D. Apply decal to cabinet door after finish painting.

END OF SECTION 10 44 00

SECTION 11 33 00 - RETRACTABLE STAIRS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Manual disappearing stairways for where attic access is indicated.

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

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 1/2" 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 11 33 00

SECTION 12 21 13 - HORIZONTAL LOUVER BLINDS PART 1 -

GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Horizontal louver blinds with aluminum slats.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches long.
- D. Samples for Initial Selection: For each type and color of horizontal louver blind.
 - 1. Include similar Samples of accessories involving color selection.
- E. Window-Treatment Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of horizontal louver blind.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.5 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. Horizontal Louver Blinds: Full-size units equal to 5 percent of quantity installed for each size, color, texture, pattern, and gloss indicated, but no fewer than five units.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Hunter Douglas Contract.
 2. Levolor Contract; a Newell Rubbermaid company.
 3. Springs Window Fashions.
- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
 1. Width: 1 inch.
 2. Thickness: Manufacturer's standard.
 3. Spacing: Manufacturer's standard.
 4. Finish: Ionized antistatic, dust-repellent, baked polyester finish.
 5. Features:
 - a. Lift-Cord Rout Holes: Minimum size required for lift cord and located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.

- C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.
 - 1. Capacity: One blind per headrail unless otherwise indicated.
 - 2. Ends: Manufacturer's standard.
 - 3. Manual Lift Mechanism:
 - a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.
 - b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
 - 4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
 - a. Tilt: Full.
 - b. Operator: Clear-plastic wand.
 - c. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over rotation of gear.
 - 5. Manual Lift-Operator and Tilt-Operator Lengths: Length required to extend to 48 inches above floor level when blind is fully closed.
 - 6. Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard, unless otherwise indicated.

- D. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
 - 1. Type: Manufacturer's standard.

- E. Lift Cords: Manufacturer's standard braided cord.

- F. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
 - 1. Type: Braided cord

- G. Valance: Manufacturer's standard.

- H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 - 1. Type: End.
 - 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.

- I. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.

- J. Colors, Textures, Patterns, and Gloss:
 - 1. Slats: As selected by Architect from manufacturer's full range.
 - 2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

2.3 HORIZONTAL LOUVER BLIND FABRICATION

- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 - 1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish:
 - 1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
 - 2. Install mounting and intermediate brackets to prevent deflection of headrails.

3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

- A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer and that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION 12 21 13

SECTION 12 35 30 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Kitchen cabinets.
 - 2. Vanity cabinets.
 - 3. Plastic-laminate countertops and backsplashes.
- B. Related Sections:
 - 1. Section 113100 "Residential Appliances" for appliances.

1.2 DEFINITIONS

- A. Exposed Surfaces of Cabinets: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors.
- B. Semiexposed Surfaces of Cabinets: Surfaces behind opaque doors or drawer fronts, including interior faces of doors and interiors and sides of drawers, and bottoms of wall cabinets.
- C. Concealed Surfaces of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, ends of cabinets installed directly against and completely concealed by walls or other cabinets, and tops of wall cabinets and utility cabinets.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Cabinets.
 - 2. Plastic-laminate countertops.
 - 3. Cabinet hardware.
- B. Sustainable Design Submittals:
 - 1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Chain-of-custody certificates indicating that wood used to produce cabinets and countertops complies with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC- accredited certification body. Include statement indicating cost for each certified wood product.
 - 3. For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.

4. For adhesives and composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: For cabinets and countertops. Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, hardware, edge and backsplash profiles, methods of joining countertops, and cutouts for plumbing fixtures.
- D. Samples for Initial Selection: For each type of material exposed to view.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified manufacturer.
- B. Product Certificates: For casework, from manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain cabinets from a manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Source Limitations for Cabinets: Obtain cabinets from single source from single manufacturer.
- C. Product Options: Drawings indicate size, configurations, and finish material of cabinets by referencing designated manufacturer's catalog numbers. Other manufacturers' cabinets of similar sizes and door and drawer configurations, same finish material, and complying with the Specifications may be considered. See Section 01 60 00 "Product Requirements."

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete and dry, and temporary HVAC system is operating and maintaining temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.
- C. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.

- D. Field Measurements for Countertops: Verify actual dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.
- B. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 CABINETS

- A. Basis of Design Product: The design for cabinets is based on Merillat Classic Fusion. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. Grandview Products Co. Inc
 - 2. MasterBrand Cabinets, Inc.
- B. Quality Standard: Provide cabinets that comply with KCMAA161.1.
 - 1. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with the above standard.
- C. Face Style: Flush overlay; door and drawer faces cover cabinet fronts with only enough space between faces for operating clearance.
- D. Cabinet Style: Face frame.
- E. Door and Drawer Fronts: Solid-wood stiles and rails, 3/4 inch thick, with 1/4-inch- thick, veneer-faced plywood center panels.
- F. Face Frames: 3/4-by-1-5/8-inch solid wood with glued mortise and tenon or doweled joints.
- G. Exposed Cabinet End Finish: Wood veneer, or plastic laminate as selected by Architect.
- H. Factory Finishing: Finish cabinets at factory. Defer only final touchup until after installation.

2.2 CABINET MATERIALS

A. General:

1. Certified Wood Materials: Fabricate cabinets with wood and wood-based products produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
2. Adhesives and Composite Wood and Agrifiber Products: Do not use products that contain urea formaldehyde.
3. Adhesives: Use adhesives that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
4. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
5. Hardwood Lumber: Kiln dried to 7 percent moisture content.
6. Softwood Lumber: Kiln dried to 10 percent moisture content.
7. Hardwood Plywood: HPVA HP-1, made with adhesive containing no urea formaldehyde.
8. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 - a. Recycled Content: Not less than 25 percent preconsumer or postconsumer recycled content.
9. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
10. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 - a. Recycled Content: Not less than 25 percent preconsumer or postconsumer recycled content.
11. Hardboard: ANSI A135.4, Class 1 Tempered.
 - a. Recycled Content: Not less than 25 percent preconsumer or postconsumer recycled content.

B. Exposed Materials:

1. Exposed Wood Species: Maple
 - a. Select materials for compatible color and grain. Do not use two adjacent exposed surfaces that are noticeably dissimilar in color, grain, figure, or natural character markings.
 - b. Staining and Finish: As selected by Architect from manufacturer's full range.
2. Solid Wood: Clear hardwood lumber of species indicated, free of defects.
3. Plywood: Hardwood plywood with face veneer of species indicated, with Grade A faces and Grade C backs of same species as faces.
 - a. Edge band exposed edges with veneer edging of same species as face veneer.

- C. Semiexposed Materials: Unless otherwise indicated, provide the following:
 - 1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects. Same species as exposed surfaces or stained to be compatible with exposed surfaces.
 - 2. Plywood: Hardwood plywood with Grade C faces and not less than Grade 3 backs of same species as faces. Face veneers of same species as exposed surfaces[or stained to be compatible with exposed surfaces].
 - 3. Vinyl-Faced Particleboard: Medium-density particleboard with embossed, wood- grain-patterned vinyl film adhesively bonded to particleboard.
 - a. Provide vinyl film on both sides of shelves, dividers, drawer bodies, and other components with two semiexposed surfaces and on semiexposed edges.
 - b. Colors, Textures, and Patterns: As selected by Architect from cabinet manufacturer's full range.

- D. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; medium-density fiberboard; or hardboard.

2.3 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as selected by Architect from manufacturer's full range.

- B. Pulls: Wire pulls.

- C. Hinges: Concealed butt hinges.

- D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or B05091.

2.4 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: KCMA A161.2.

- B. Configuration: Provide countertops with the following front, cove (intersection of top with backsplash), backsplash, and endsplash style:
 - 1. Front: No drip (raised marine edge with rolled front).
 - 2. Cove: Cove molding (one-piece postformed laminate supported at junction of top and backsplash by wood cove molding).
 - 3. Backsplash: Curved or waterfall shape with scribe.
 - 4. Endsplash: None.

- C. Plastic-Laminate Substrate: Particleboard not less than 3/4 inch thick.
 - 1. For countertops at sinks and lavatories, use Grade M-2-Exterior-Glue particleboard or exterior-grade plywood.
 - 2. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of particleboard laminated to top.

- D. Paper Backing: Provide paper backing on underside of countertop substrate.

2.5 COUNTERTOP MATERIALS

- A. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD3.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following as indicated on the finish legend:
 - a. Nevamar.
 - b. Wilsonart International.
 - 2. Grade: HGS.
 - 3. Provide through-color plastic laminate.
 - 4. Grade for Backer Sheet: BKL.
 - 5. Colors, Textures, and Patterns: As indicated by manufacturer's designations.
- B. Certified Wood Materials: Fabricate countertops with wood and wood-based products produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- C. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small- Scale Environmental Chambers."
- D. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
 - 1. Recycled Content: Not less than 25 percent preconsumer or postconsumer recycled content.
- E. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- F. Adhesives: Do not use adhesives that contain urea formaldehyde.
- G. Adhesives: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.
- B. Install cabinets without distortion so doors and drawers fit openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.

- C. Install cabinets and countertop level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Fasten cabinets to adjacent units and to backing.
 - 1. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c., with toggle bolts through metal backing behind gypsum board.
- E. Fasten plastic-laminate countertops by screwing through corner blocks of base units into underside of countertop. Form seams using splines to align adjacent surfaces, and secure with glue and concealed clamping devices designed for this purpose.
 - 1. Provide cutouts for sinks and lavatories, including holes for faucets and accessories.
 - 2. Seal edges of cutouts by saturating with varnish.

3.2 ADJUSTING AND CLEANING

- A. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- B. Clean casework on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 12 35 30

SECTION 21 10 00 - FIRE PROTECTION

PART 1 – GENERAL

1.1 PROJECT SUMMARY

- A. Work in this Section includes, but is not necessarily limited to providing all engineering and associated costs, calculations, labor, materials, supervision, testing, permits and approvals required to design, install and obtain final acceptance of the automatic fire protection sprinkler system complete in all respects.
- B. The fire protection system shall provide full and complete coverage of all areas, and shall be compatible with the contract document layouts and avoid interference with work of all other trades in the building. Contractor shall provide offsets as needed to avoid other trades, including but not limited to mechanical ductwork, hydronic piping, structural elements and lighting. Contractor shall provide any additional heads, piping and appurtenances required in order to satisfy complete coverage of the building in accordance with NFPA.
- C. Provide fire protection system complete with all component equipment and material items. Install and test in full conformity with the requirements of all applicable codes, National Fire Protection Association (NFPA) 13 Edition.

1.2 RELATED SECTIONS – NOT USED

1.3 DEFINITIONS

- A. Working Plans: Documents, including shop drawings, calculations, and material specifications prepared according to NFPA 13 for obtaining approval from authorities having jurisdiction.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Sprinkler systems shall not be calculated to less than 5 psi or 10% below the actual water supply available, whichever is greater. Sprinkler plans and calculations must take into account and show elevation loss from the flow test location to the flowing sprinklers. Flow test information must be recent to within one (1) year previous to submittal of sprinkler drawings.
- B. NFPA standards require that the spray deflector of the sprinkler heads be installed eighteen (18") inches minimum above the top of the merchandise stored in piles, racks, shelves or displays.

- C. Sprinkler deflectors shall be positioned to avoid obstruction to both activation and discharge. Obstructions are (but are not limited to) lights, diffusers, duct-work, structural members (false or real), displayed signage or any object capable of impeding the proper activation and discharge of the fire sprinklers. Installation shall comply to the referenced NFPA 13 document (Chapter 4) and the manufacturers listing. The sprinkler contractor shall be responsible for final coordination.
- D. All obstructions exceeding four (4') feet wide or which cannot be spaced around (to comply with 1.4.F) shall have sprinklers installed beneath the obstruction. If sprinklers are installed at or below 7'.6" they shall be equipped with a listed head guard.
- E. All sprinkler heads in finished ceilings shall be symmetrically spaced to provide proper coverage, and to avoid interference with lights, diffusers, grilles, or other ceiling mounted equipment. The head layout shall conform to the typical pattern.
- F. All overhead piping located in areas containing ceilings shall run concealed above the ceiling, without exception.
- G. Consult the bid specification drawings for acceptable locations for all piping to be run exposed (areas without ceilings).
- H. Inspector's tests to be provided with half-inch orifice, discharging at three (3") inches above a hard paved surface. Provide pressure relief valves at inspectors test locations on all "grid" type systems. All inspector's test shall not be located behind racking or other obstructions, and shall be located within eighteen (18") inches of an exterior door opening.
- I. Provide flushing and drainage as per required in NFPA 13.
- J. Provide fire department connection. The exact placement and model of the fire department connection shall be verified with the local jurisdiction. Refer to the provided fire sprinkler drawings for location and arrangement.
- K. System control valves accessed from the interior of the riser area and shall be tampered butterfly valves.
- L. Provide sprinkler protection at electrical rooms per the requirements of the local jurisdiction.
- M. The calculations shall include all sprinklers within the most hydraulically demanding area along each branch line within the distance determined using a 1.2 multiplier (times the square root of the area).
- N. The contractor shall provide a valve connection discharging onto a paved (outside) surface, to allow full system demand to flow forward of the backflow preventor for testing. The test connection shall be capable of full system flow and shall not require system drainage or alteration. Note, the two (2") inch main drain and FDC are not acceptable.

1.5 SUBMITTALS

- A. The contractor shall submit complete shop (working) plans in all aspects in accordance with NFPA 13 (Chapter 6). Include complete calculations and all material data and engineering sheets including but not limited to:
 - 1. Underground materials (pipe, fittings, valve, rod, etc.).
 - 2. Pipe and fitting.
 - 3. Hangers and supports.
 - 4. Seismic restraints.
 - 5. Valve(s) – any type.
 - 6. Alarm devices including electric.
 - 7. Fire department connections.
 - 8. Hose valves (if applicable).
 - 9. Sprinklers.
 - 10. Gauges.
 - 11. Flow Switches.
 - 12. Air Compressors.
- B. Fire Sprinkler shop drawings (2 sets of working plans, product data and hydraulic calculations) are to be submitted for review after the Engineer of record is satisfied that the shop drawings satisfy the requirements of the NFPA 13 and the project documents. The Engineer of record shall cite such approval on the shop drawings.
- C. Coordinate the sprinkler system to avoid interference with work of all other trades in the building. Examine the contract documents and make any modifications needed for a complete shop drawing.
- D. Submit shop drawings. Permit ample time for review and potential correction prior to start of work. No fabrication is permitted until approval is obtained.
- E. Submit revised drawings and calculations for review and approval as required to accommodate changes to the architectural plan and other contract documents during construction.
- F. Actual loss through any backflow devices must be accounted for in calculations. Sprinkler contractor shall submit, with their calculations and shop drawings a manufacturer's flow chart indicating pressure loss through the device(s) at the required flows.

PART 2 – PRODUCTS

2.1 GENERAL PARAMETERS

- A. All materials submitted and installed shall be UL listed, individually or as any assembly to be installed in a fire protection system.
- B. All materials shall be acceptable to all national and local applicable codes and standards.

2.2 SPRINKLER HEADS

- A. No sprinklers to be installed are permitted to have a rubber O-ring seal. Only metallic "spring seal" or equivalent seals are allowed.
- B. All sprinkler types and temperature ratings shall be as indicated on the drawings.

2.3 BRACKETS

- A. Brackets for attaching pipe hangers to building structure shall be the size and type for the intended use, and acceptable to the structural engineer in accordance with NFPA 13.

2.4 SWITCHES

- A. Provide all tamper and flow switches for indicating control valves and systems and as required by local ordinances.

2.5 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those indicated on drawings.

2.6 PIPE AND FITTINGS

- A. Ductile-Iron Pipe: AWWA C151, push-on-joint type, with cement-mortar lining and seal coat according to AWWA C104. Include rubber gasket according to AWWA C111.
- B. Ductile-Iron Pipe: AWWA C151, mechanical-joint type; with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber according to NFPA 1963 and matching local fire department sizes and threads, and bottom outlet with pipe threads. Include brass, lugged caps, gaskets, and brass chains; brass, lugged swivel connection and drop clapper for each hose-connection inlet; eighteen (18") inch (460- mm) high brass sleeve; and round, floor, brass, escutcheon plate with marking "AUTO SPKR."
 - 1. Finish Including Sleeve: Polished chrome-plated.
 - 2. Finish Including Sleeve: Rough chrome-plated.
 - 3. Finish Including Sleeve: Polished brass.
- C. Steel Pipe: ERW or CW schedule 10 or 40. All fittings shall comply with NFPA 13.
- D. CPVC: ASTM 437-439, Blazemaster or approved equal.

2.7 FIRE DEPARTMENT CONNECTIONS

- A. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector; with 250 psig (1725-kPa) pressure rating; and designed for horizontal or vertical installation. Include two (2) single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts 7A, 125-V ac and 0.25A, 24-V dc; complete with factory- set, field-adjustable retard element to prevent false signals and tamperproof cover that send signal if removed.
- B. Pressure Switches: UL 753; electrical-supervision type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.
- C. Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.
- D. Indicator-Post Supervisory Switches: UL 753; electrical; single-pole, double throw, with normally closed contacts, Include design that signals controlled indicator-post valve is in other than fully open position.

2.8 PRESSURE GAUGES

- A. Pressure Gauges: UL 393, 3 ½ to 4 ½ inch -)90 to 115 mm) diameter dial with dial range of 0 to 300 psig (0 to 1725 kPa).

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Furnish and install under this Section all hangers and steel fabrications, other than building structure, required for proper support of piping and equipment.

3.2 HANGER ATTACHMENTS

- A. Support of pipes with diameter larger than 2 ½ inches may require modification of structural members to support increased loads. Suspend piping and equipment supported by building structure only by those methods, and only at those locations acceptable to the structural engineer.
- B. Provide supplementary supporting steel fabrication to bridge between structural steel fabrication to bridge between structural members to receive the hanger. Attach supplementary members to building structure only by those methods, and at those locations acceptable to the structural engineer.

3.3 INSPECTION, TESTING, AND CLEANING

- A. Arrange for all inspections, examinations and tests in full conformity with the requirements of all applicable codes, National Fire Protection Association (NFPA) standards and authority having jurisdiction necessary to obtain complete and final acceptance of the fire sprinkler system.
- B. Flush underground piping and pressure test at 200 psi for two (2) hours prior to connection to overhead piping. Flushing and testing shall be witnessed by the Fire Department.
- C. Leave entire sprinkler system clean in every respect at the conclusion of the work.
- D. Testing will occur after installation of all systems has been completed (approximately two (2) to three (3) weeks prior to opening). The contractor shall be required to provide a lift, air, and water pumps for system pressurization, and any necessary hand tools and apparatus for complete testing and draining of the systems. One (1) test of all systems should be completed within one (1) day. If all or any systems fail, the contractor shall be responsible to be present and furnish all items listed above until such time that systems are found to be acceptable or in accordance with NFPA 13, 25, and the bid documents. The contractor is responsible for notifying the Owner when installation is complete and testing may begin. Please allow five (5) to ten (10) working days for scheduling.
- E. The contractor shall furnish to the owner a complete set of signed and witnessed test certificates for the following:
 - 1. Underground flushing.
 - 2. Underground hydrostatic test.
 - 3. Interior system hydrostatic test(s).
 - 4. All system trip tests.
- F. The Contractor shall train owner on use of all equipment and furnish two (2) copies to be left on site, of NFPA 25 the latest edition, and all apparatus manuals, please allow seven (7) days for scheduling.

3.4 WARRANTY

- A. Provide warranty in accordance with the General Conditions for a period of at least one (1) year.

END OF SECTION 21 10 00

SECTION 22 07 19 - PIPING INSULATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.2 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
- C. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- D. ASTM C 449/C 449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- E. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation.
- F. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

1.3 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 5 years of experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 – PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84.

2.2 GLASS FIBER

- A. Insulation: ASTM C 547; rigid molded, noncombustible.
 - 1. 'K' ('Ksi') value: ASTM C 177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum service temperature: 850 degrees F (454 degrees C).
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- B. Insulation: ASTM C 547; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. 'K' ('Ksi') value: ASTM C 177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum service temperature: 650 degrees F (343 degrees C).
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96 of 0.02 perm-inches (0.029 ng/Pa s m).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- E. Vapor Barrier Lap Adhesive:
 - 1. Compatible with insulation.
- F. Insulating Cement/Mastic:
 - 1. ASTM C 195; hydraulic setting on mineral wool.
- G. Indoor Vapor Barrier Finish:
 - 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
 - 2. Vinyl emulsion type acrylic, compatible with insulation, white color.
- H. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

I. Insulating Cement:

1. ASTM C 449/C 449M.

2.3 CLOSED CELL MOLDED

A. Insulation: ASTM C 578; rigid closed cell.

1. 'K' ('Ksi') value: 0.23 at 75 degrees F (0.033 at 24 degrees C).
2. Maximum service temperature: 165 degrees F (74 degrees C).
3. Maximum water vapor permeance: 5.0 perms (287 ng/Pa s sq m)

2.4 JACKETS

A. PVC Plastic.

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (-18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.00029 ng/Pa s sq m), maximum, when tested in accordance with ASTM E 96.
 - d. Thickness: 15 mil (0.38 mm).
 - e. Connections: Brush on welding adhesive.
2. Covering Adhesive Mastic:
 - a. Compatible with insulation.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
 - G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
 - H. Glass fiber insulated pipes conveying fluids above ambient temperature:
 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
 - I. Inserts and Shields:
 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
 2. Shields: Steel between pipe hangers or pipe hanger rolls and inserts.
 3. Insert location: Between support shield and piping and under the finish jacket.
 4. Insert configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
 - J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to drawings.
 - K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

3.3 SCHEDULES

- A. Plumbing Systems:
 1. Domestic Water Supply:
 - a. Closed Cell Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1/2 inch Cold Water except for Pex piping, 3/4" Hot Water.
- B. Cooling and Heating Systems:
 1. Cold Condensate Drains and drains accepting condensate: All sizes, Glass Fiber 1 1/2 ".
 2. Refrigerant Suction: Closed Cell in accordance with Manufacturer's instructions.
 3. Refrigerant Hot Gas: Closed Cell in accordance with Manufacturer's instructions.

END OF SECTION 22 07 19

SECTION 22 10 05 – PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Natural Gas.

1.2 REFERENCES

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers (ANSI B16.18).
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- C. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.1).
- D. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- E. ASTM B 32 - Standard Specification for Solder Metal.
- F. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
- G. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.
- H. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- I. ASTM D 2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- J. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- K. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
- L. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

- M. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society.
- N. AWWA C651 - Disinfecting Water Mains; American Water Works Association; (ANSI/AWWA C651).
- O. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- P. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- Q. NFPA 54 - National Fuel Gas Code; National Fire Protection Association.
- R. ASTM D 1784 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

1.3 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with local standards.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.5 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with plumbing code.
- B. Conform to local requirements for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on steel valves.

- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen.

1.8 EXTRA MATERIALS

- A. Provide two repacking kits for each size valve.

PART 2 - PRODUCTS

2.1 SANITARY AND STORM SEWER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. PVC Pipe: ASTM D 2665 or ASTM D 3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.2 SANITARY AND STORM SEWER PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D 1785 Schedule 40, or ASTM D 2241 SDR 26 for not less than 150 psi (1 034 kPa) pressure rating.
 - 1. Fittings: ASTM D 2466, PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 Solvent cement. Mechanical joint restraints on bottom 20' of vertical stacks and to 20' once turned horizontal (except buried).

2.3 WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Copper Pipe: ASTM B 42, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: ASTM B 32, alloy Sn95 solder.

2.4 WATER PIPING, ABOVE GRADE

- A. CPVC Pipe: ASTM D 1784 Schedule 80.
 - 1. Fittings: ASTM D 1784, CPVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 Solvent cement.
- B. Polyethylene (PEX) Tubing: ASTM F876/F877.
 - 1. Fittings: ASTM F1281 Expansion Fittings
 - 2. Joints: Expansion.

2.5 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, wrought steel welding type.
 - 2. Joints: NFPA 54, threaded or welded to ASME B31.1.

2.6 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
 - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch (25 mm):
 - 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 - 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
 - 1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 2. Sealing gasket: "C" shape composition sealing gasket.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.7 PIPE HANGERS AND SUPPORTS

- A. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Conform to ASME B31.9.
 - 2. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
 - 6. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
 - 7. Vertical Support: Steel riser clamp.
 - 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- B. Plumbing Piping - Water:
 - 1. Conform to ASME B31.9.
 - 2. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Carbon steel, adjustable swivel, split ring.

3. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.
5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
7. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
8. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
9. Vertical Support: Steel riser clamp.
10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
11. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

2.8 GATE VALVES

- A. Up To and Including 3 Inches (80 mm): MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, threaded ends.

2.9 BALL VALVES

- A. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, threaded ends with union.

2.10 BUTTERFLY VALVES

- A. Construction 1-1/2 Inches (40 mm) and Larger: MSS SP-67, 150 psi CWP, cast or ductile iron body, aluminum bronze disc, resilient replaceable EPDM seat, grooved ends, extended neck, infinite position lever handle with memory stop.

2.11 FLOW CONTROLS

- A. Construction: Class 125, Brass or bronze body with union on inlet, temperature and pressure test plug on inlet.
- B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- M. Install bell and spigot pipe with bell end upstream.
- N. Install valves with stems upright or horizontal, not inverted.

- O. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- P. Install water piping to ASME B31.9.
- Q. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.
- R. Sleeve pipes passing through partitions, walls and floors.
- S. Inserts:
 1. Provide inserts for placement in concrete formwork.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- T. Pipe Hangers and Supports:
 1. Install in accordance with ASME B31.9.
 2. Support horizontal piping as scheduled.
 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 8. Provide copper plated hangers and supports for copper piping.
 9. Prime coat exposed steel hangers and supports. Refer to Section 099000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 10. Provide hangers adjacent to motor driven equipment with vibration isolation.

3.4 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

- D. Install gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install butterfly valves for throttling, bypass, or manual flow control services.
- F. Provide flow controls in water recirculating systems where indicated.
- G. Provide spring loaded check valves on discharge of water pumps.
- H. Provide plug valves in natural gas systems for shut-off service.

3.5 ERECTION TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/8 inch per foot (1:100) slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

- a. Pipe size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
 - 1) Maximum hanger spacing: 6.5 ft (2 m).
 - 2) Hanger rod diameter: 3/8 inches (9 mm).
- b. Pipe size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
 - 1) Maximum hanger spacing: 10 ft (3 m).
 - 2) Hanger rod diameter: 3/8 inch (9 mm).
- c. Pipe size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
 - 1) Maximum hanger spacing: 10 ft (3 m).
 - 2) Hanger rod diameter: 1/2 inch (13 mm).

2. Plastic Piping:

- a. All Sizes:
 - 1) Maximum hanger spacing: 4 ft (1.2 m).
 - 2) Hanger rod diameter: 3/8 inch (9 mm).

END OF SECTION 22 10 05

SECTION 23 00 01 - MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 REFER TO DIVISION 1 FOR FULL PROJECT SCOPE OF WORK

1.2 MECHANICAL SCOPE OF WORK

- A. Heating, ventilating, air conditioning systems, plumbing, and other piping systems modifications as specified; complete and in operating order.
- B. Maintenance of heating and air conditioning equipment used for temporary heating, cooling, and for testing.
- C. Installation of all mechanical control components which require mechanical connections only, both mechanical and electrical connections, penetrations of air plenums and ducts, or installations into piping systems.
- D. All low voltage and line voltage control wiring, conduit, and devices for systems furnished under this division.
- E. Counterflashing of penetrations of roof or exterior walls by pipes, ducts, or other Work under this Division.
- F. Cutting and patching required due to omissions in the installation of Work under this Division, or due to failure to properly coordinate Work with other Divisions.
- G. Painting and labeling of pipe, ductwork, equipment, and devices furnished under this Division.
- H. Furnish access panels required for equipment furnished and installed under this Division.

1.3 RELATED ELECTRICAL WORK

- A. Wiring and conduit for electrical power shall be furnished and installed under Division 26.

1.4 OTHER RELATED WORK UNDER OTHER DIVISIONS

- A. Flashing of ducts and pipes into roofs and outside walls.
- B. Holes, chases, and recesses required for mechanical work.
- C. Miscellaneous steel including equipment supports.

1.5 CONFLICTS

- A. Designer shall be notified in writing at least ten (10) days prior to the Bid Date of any conflicts or items requiring clarification. Resolution shall be only by written notice from the Designer. Oral clarifications shall be confirmed in writing.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

- A. The requirements listed below are given as a supplement to those in Division 1 and do not relieve the Contractor of complying with any and all applicable regulatory requirements set forth in this Specification.
- B. Obtain and pay for the required permits, inspection fees, tapping fees, connection charges, and utility company service charges.
- C. The mechanical work installation shall comply with State and local Health Departments and Building Codes, applicable Life Safety Code, State and local ordinances, and with NFPA Standard 90A and 90B.
- D. Equipment shall be U.L. listed. All installations shall comply with U.L. standards, where applicable.
- E. Equipment and Work shall comply with existing noise and safety standards.
- F. Certificates of compliance from authorities having jurisdiction shall be transmitted to the Engineer and the Owner. Complete all work, pay all fees, and arrange for tests to obtain certificates of compliance.

1.7 SUBMITTALS

- A. Submit to the Designer for review certified shop drawings on material furnished under this division as listed below. Submittal data shall be checked and stamped approved by the Contractor prior to his transmitting to the Designer. Refer to Division 1 for additional requirements.
- B. Submittals shall be bound in three-ring binders and indexed with a table of contents for each indexed section. Table of contents shall list item, manufacturer, and model number. Large drawings shall be attached to binder or inserted in pockets of binder.
- C. Submittal books shall be complete with all information required for this project prior to submittal. Submittals will be reviewed two (2) times only. The first review will include all items submitted. The second review will verify that comments noted on the first review have been resolved. Additional reviews required due to failure of Contractor to comply with Contract documents shall be at the Contractor's expense.

- D. Submittals shall contain rating data, accessories and features, the same as listed in specifications and capacities, shall be stated in the terms specified. Deviations from specifications and drawings shall be noted on the submittal. If none are noted, it shall be assumed the material meets the specified requirements fully.
- E. Where preprinted manufacturer's data describes more than one (1) product, mark submittals to indicate the specific product to be provided for this Project. Delete or mark out significant portions of pre-printed data which is not applicable. Where operating curves, graphs, etc. are required, mark the operating point or range for the Project.
- F. Requests for substitution of products not specifically named shall be submitted in writing a minimum of fourteen (14) calendar days prior to the bid date. Requests shall include section number, items, name of manufacturer to be substituted, and catalog data. Requests shall be reviewed only to approve or reject submission of detailed submittals as noted in other paragraphs of this Section.
- G. Acceptable manufacturers are noted in each section. Do not substitute materials, equipment, or methods unless such substitution has been approved in writing. Where the phrase "approved equal" appears, do not assume that materials, equipment, or methods will be approved until specific written approval has been given. The burden of proof for requested substitutions rests with the Contractor.
- H. Approved substitution requiring variations in quantity or arrangement of materials, or equipment from that specified, or indicated on drawings shall be furnished and installed by the Contractor at no additional cost to the Owner.
- I. Work shall not proceed until submittals for equipment and shop drawings have been approved. Work installed using unapproved substitutions shall be replaced at no additional cost to the Owner.

1.8 GUARANTEE, MAINTENANCE, AND OPERATING INSTRUCTIONS

A. Guarantee

Refer to Division 1 for additional requirements for guarantees.

- 1. Equipment shall be turned over to Owner clean and in complete working order with full one (1) year warranty by the manufacturer. Use of equipment for temporary heating or cooling shall not be included as part of the warranty period.

B. Maintenance

- 1. Work furnished and installed under this Division shall be maintained including inspection, lubrication, etc., in accordance with manufacturer's recommendations until acceptance of system by Owner.

C. Operating Instructions:

- 1. Refer to Division 1 for O & M Requirements.

1.9 RECORD DRAWINGS

- A. At completion of Work, prepare mechanical record drawings to accurate scale. Drawings shall indicate piping connections, other service connections, and interfaces with other Work including structural supports.
- B. Indicate portions of mechanical Work shown on record drawings which deviate from Work as indicated in the contract drawings and note the reasons for such deviations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 23 00 01

SECTION 23 05 01 - BASIC MATERIALS AND METHODS

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.

PART 2 - PRODUCTS

2.1 ELECTRICAL EQUIPMENT

- A. Motor controllers, protective devices, etc. for control and protection of equipment shall be furnished with the equipment; but installed and electrically connected to power source under "Electrical Division".
- B. NEMA Standards shall be taken as a minimum requirement for electrical equipment.
- C. Equipment shall operate properly under a 10% plus or minus frequency variation.
- D. Unless noted otherwise, motors shall be squirrel-cage induction type with ball bearings. Motors 1/2HP and smaller shall be 120 volts, single phase with permanently lubricated bearings; 3/4 HP and larger shall be 3 phase, general purpose, Design "B" or "C", drip proof type. Verify characteristics of available current at the building before equipment is ordered.
- E. Motors shall be in accordance with IEE, UL and NEMA Standards, non-radio interfering type, rated for continuous, full-load duty and capable of withstanding momentary overloads of 50%. Select motors so actual loads does not exceed nameplate rating, and does not use motor "service factor". "Open" motors shall be rated 40 degrees C.; "totally enclosed" type shall be 50-degrees C. rated. Motors over 5 HP shall be "high efficiency" type and so labeled.
- F. Provide both overload and under-voltage protection in all phases.
- G. Except where interlock or automatic control is required, single speed motors, and smaller than 1/2 HP have manual switch with pilot light and thermal overload protection. H. For manual operation of 3/4 HP and larger motors, furnish magnetic starter with:
 - 1. Maintained contact PB and pilot light or momentary contact pushbutton station and pilot when directed.
 - 2. Trip free, thermal overload relays.
 - 3. Capable of accepting electrical interlocks.
- H. Where interlock or automatic operation is specified, regardless of HP, provide magnetic starter complete with RUN/OFF/AUTO switch so connected that in "RUN" or "AUTO" all safety controls shall stop the motor.

- I. All magnetic starters shall have control circuits individually fused from line side of starter, or load side of breaker. All starters on service 200 volts and above shall have 120 volt, built-in control circuit transformer fused on line and load side.
- J. Provide dual element fused disconnect for all hermetic motors above 3/4 HP.
- K. Heating Equipment: Phase and voltage as noted or unless noted otherwise.
- L. Contactors shall be UL listed for 100,000 cycles of operation.
- M. Normal operation pilot lights shall be green; emergency condition signal lights shall be red.

2.2 EQUIPMENT ACCESSORIES

- A. AS NOTED UNDER SPECIFIC EQUIPMENT SCHEDULES AND SPECIFICATIONS.

2.3 ACCESS PANELS

- A. Provide access panels, or doors, at concealed dampers, valves, shock absorbers, vents, trap primers, inspection points, etc. and where noted. Panels shall be galvanized steel, 16 gauge frame, 14 gauge door with mounting accessories, spring hinges, screwdriver operated lock, and prime coat paint. Milcor "A" for acoustic tile, "M" for exposed masonry, "K" for plaster finishes, stainless steel for ceramic, or glazed structural tile. Where ceiling is "lift out" construction, ceiling access panels are not required. Panels shall be 18" x 18" or larger, as required for service intended.
- B. Access doors giving access to "live" electrical gear shall have switch to cut off power when opened.
- C. Access panels in fire rated construction shall have a UL label, Class B rating.

- 2.4 CONCRETE: Where required for thrust blocks, pipe system encasement, equipment bases, etc. for Division 21, 22, and 23, provide 3,000 PSI concrete.

PART 3 - EXECUTION

3.1 ELECTRICAL WORK

- A. All electrical work shall be provided under "Electrical Division 26", except: (1) motor controls (2) interlock circuits, (3) control circuits, (4) temperature-humidity controls. For these excepted items, this division shall provide conduit, wiring, connections, etc. as required for a complete control installation according to the appropriate sections of Specifications.
- B. The work under this Division shall be of the same type and quality as specified under "Electrical Division".

3.2 EXCAVATION, SHORING AND BACKFILL

- A. Provide any excavation required for this Division below that needed for general construction. Unless specifically noted, no extra shall be paid if rock or excavation difficulties are encountered.
- B. Provide separate trench for each utility.
- C. Provide: (1) bracing, shoring, etc. to protect sides of excavation, (2) staging, suitable ladders, barricades, etc. Comply with local regulations, or absence thereof with Division of the Manual of Accident Prevention provided for in Construction of the AGC.
- D. Remove all timber before backfilling. Backfill simultaneously on both sides of tanks, piping, etc. Backfill material shall be approved clay or chert, free of debris, rock larger than 1" or other harmful material.
- E. All backfilling shall be compacted to 90% under sidewalks, or grass areas, and to 95% when under paved areas, structures, building slabs, steps, etc. These percentages refer to "Percent of Maximum Density" per ASTM #D-1557. If more stringent, compact backfill to a dry density equal to that required by G.C.
- F. Restore existing pavement, curbs, sidewalks, sodding, etc. removed or damaged in connection with work.

3.3 CUTTING AND PATCHING

- A. Provide all cutting, patching, etc. incidental to this work.
- B. Do not cut into any structural element without written approval of Structural Engineer.
- C. Patching shall be: (1) of quality equal to, and of appearance matching existing construction, and (2) shall restore all services and construction which remains in use to its condition prior to this contract, unless otherwise noted.

3.4 PIPING THRU RATED WALLS AND FLOORS

- A. Insulation on pipe passing thru fire rated walls must stop at pipe sleeve unless 3M fire barrier fire stopping is used. Space between pipe and sleeve shall be protected with 3M 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. Maintain vapor barrier on insulated chilled water and refrigerant suction piping.
- B. PVC pipe passing through rated walls or floors shall have 3M UL Modified Fire Stop System, Pro-Set System or Hilti.
- C. Refer to details on drawing for pipe and duct penetration thru rated walls and floors.

3.5 FLASHING

- A. Where pipes, ducts, etc. pass through roof, flash per manufacturers recommendations.
- B. Locate pipes, ducts, etc. through roof to clear parapets, etc. by at least 18".
- C. Provide flashing or caulking as required at each opening through outside walls or roof. Flashing through roof of same materials and methods as under "Moisture Protection Division"; through walls shall be aluminum unless noted otherwise.

3.6 PROTECTION

- A. Work shall be protected at all times. Pipe openings shall be closed with caps or plugs until permanent connections are made. Fixtures and equipment shall be covered if necessary, to protect against dirt, water, chemical or mechanical damage or defacement.
- B. All piping indicated to be installed above ceilings in walls or crawl spaces, shall be placed on the heated space side of the building insulation to prevent freezing. Piping indicated to be installed in areas outside heated envelope to be protected by the application of electric heat tape under pipe insulation. The Contractor shall be responsible in contacting the Architect/Engineer before installing and subjecting any piping to freezing conditions.

3.7 TEMPORARY WORK:

- A. Water and electricity consumed during construction shall be paid for by General Contractor.

END OF SECTION 23 05 01

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.

1.2 REFERENCES

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council.
- B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau.
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association.

1.3 SUBMITTALS

- A. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Submit to the Engineer within two weeks after completion of testing, adjusting, and balancing.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 3. Provide reports in 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
 - 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 6. Units of Measure: Report data in I-P (inch-pound) units only.
 - 7. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.

- d. Project name.
- e. Project location.
- f. Project Architect.
- g. Project Engineer.
- h. Project Contractor.
- i. Project altitude.
- j. Report date.

- C. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

1.4 QUALITY ASSURANCE (moved to PART 3)

1.5 PRE-BALANCING MEETING (moved to PART 3)

1.6 SEQUENCING AND SCHEDULING (moved to PART 3)

1.7 WARRANTY (moved to PART 3) PART 2

PRODUCTS - NOT USED

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC MN-1, AABC National Standards for Total System Balance.
 - 2. ASHRAE STD 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
 - 4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
 - 5. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of 5 years documented experience.
 - 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org.

- c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.

E. TAB Supervisor Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
 - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.
- C. Provide additional balancing devices as required.

3.4 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.

2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.6 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
 - J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
 - K. Where modulating dampers are provided, take measurements and balance at extreme conditions.
 - L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure.
- 3.7 SCOPE
- A. Test, adjust, and balance the following:
 - 1. All new systems
 - 2. Recirculation of Potable Hot Water Systems
 - 3. Heating/Cooling Units
 - 4. Air Handling Units
 - 5. Fans
 - 6. Air Filters
 - 7. Air Terminal Units
 - 8. Air Inlets and Outlets
- 3.8 MINIMUM DATA TO BE REPORTED
- A. Electric Motors:
 - 1. Manufacturer
 - 2. Model/Frame
 - 3. HP/BHP
 - 4. Phase, voltage, amperage; nameplate, actual, no load
 - 5. RPM
 - 6. Service factor
 - 7. Starter size, rating, heater elements
 - 8. Sheave Make/Size/Bore
 - B. V-Belt Drives:
 - 1. Identification/location
 - 2. Required driven RPM
 - 3. Driven sheave, diameter and RPM
 - 4. Belt, size and quantity
 - 5. Motor sheave diameter and RPM
 - 6. Center to center distance, maximum, minimum, and actual
 - C. Air Moving Equipment:
 - 1. Location
 - 2. Manufacturer
 - 3. Model number
 - 4. Serial number
 - 5. Arrangement/Class/Discharge
 - 6. Air flow, specified and actual
 - 7. Return air flow, specified and actual

8. Outside air flow, specified and actual
 9. Total static pressure (total external), specified and actual
 10. Inlet pressure
 11. Discharge pressure
 12. Sheave Make/Size/Bore
 13. Number of Belts/Make/Size
 14. Fan RPM
 15. Total HW and CHW flow, specified and actual
- D. Return Air/Outside Air:
1. Identification/location
 2. Design air flow
 3. Actual air flow
 4. Design return air flow
 5. Actual return air flow
 6. Design outside air flow
 7. Actual outside air flow
 8. Return air temperature
 9. Outside air temperature
- E. Exhaust Fans:
1. Location
 2. Manufacturer
 3. Model number
 4. Serial number
 5. Air flow, specified and actual
 6. Total static pressure (total external), specified and actual
 7. Inlet pressure
 8. Discharge pressure
 9. Sheave Make/Size/Bore
 10. Number of Belts/Make/Size
 11. Fan RPM
- F. Air Distribution Tests:
1. Air terminal number
 2. Room number/location
 3. Terminal type
 4. Terminal size
 5. Area factor
 6. Design velocity
 7. Design air flow
 8. Test (final) velocity
 9. Test (final) air flow
 10. Percent of design air flow
- G. Potable Water:
1. Location of circuit setter
 2. Design Flow
 3. Actual Flow

END OF SECTION 23 05 93

SECTION 23 07 13 - DUCT INSULATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Duct insulation.

1.2 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- C. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- D. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

1.3 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures which ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of experience.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 – PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84.

2.2 GLASS FIBER, FLEXIBLE

- A. Insulation: ASTM C 553; flexible, noncombustible blanket.
 - 1. 'K' ('Ksi') value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C 518.
 - 2. Maximum Service Temperature: 450 degrees F (232 degrees C).
 - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
- B. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s sq m), when tested in accordance with ASTM E 96.
 - 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- D. Outdoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- E. Tie Wire: Annealed steel, 16 gage (1.5 mm).

2.3 GLASS FIBER, RIGID

- A. Insulation: ASTM C 612; rigid, noncombustible blanket.
 - 1. 'K' ('Ksi') value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C 518.
 - 2. Maximum service temperature: 450 degrees F (232 degrees C).
 - 3. Maximum Water Vapor Sorption: 5.0 percent.

4. Maximum Density: 8.0 lb/cu ft (128 kg/cu m).

B. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s sq m), when tested in accordance with ASTM E 96.
3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
2. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.4 JACKETS

A. Aluminum Jacket: ASTM B 209 (ASTM B 209M).

1. Thickness: 0.016 inch (0.40 mm) sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
 1. Provide insulation with vapor barrier jackets.
 2. Finish with tape and vapor barrier jacket.
 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

- D. Insulated ducts conveying air above ambient temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- E. Ducts Exposed in Mechanical Equipment Rooms: Finish with aluminum jacket.
- F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with calked aluminum jacket with seams located on bottom side of horizontal duct section.
- G. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3.3 SCHEDULES

- A. Supply and Fresh Air Ducts: Glass Fiber 2" Thick.
- B. Return and Relief Ducts in Mechanical Rooms: Glass Fiber, 1-1/2" Thick.
- C. Ducts Exposed to Outdoors: Glass Fiber 2-1/2" Thick.

END OF SECTION 23 07 13

SECTION 23 31 00 - HVAC DUCTS AND CASINGS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Metal ductwork.
- B. Ductwork Cleaning.

1.2 REFERENCES

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.
- D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.
- E. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association.
- F. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association.
- G. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

1.3 PERFORMANCE REQUIREMENTS

- A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.4 SUBMITTALS

- A. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.
- B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of experience.

1.6 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96 standards.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Steel Ducts: ASTM A 1008/A 1008M, Designation CS, cold-rolled commercial steel.
- B. Aluminum Ducts: ASTM B 209 (ASTM B 209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.
- C. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. VOC Content: Not more than 250 g/L, excluding water.
 - 3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.
 - 4. For Use with Flexible Ducts: UL labeled.
- D. Hanger Rod: ASTM A 36/A 36M; steel; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

- B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch (100 mm) cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- F. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.3 MANUFACTURED METAL DUCTWORK AND FITTINGS

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

2.4 KITCHEN HOOD DUCTWORK AND FITTINGS

- A. Provide in accordance with IMC 2012, NFPA 96 and details on design drawings. Maintain required slope and avoid cavities where grease can collect. Provide access doors for maintenance.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- C. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

- D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal cap with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Connect terminal units to supply ducts with one foot (300 mm) maximum length of flexible duct. Do not use flexible duct to change direction.
- I. Connect diffusers or light troffer boots to low pressure ducts with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.
- J. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.
- K. Set plenum doors 6 to 12 inches (150 to 300 mm) above floor. Arrange door swings so that fan static pressure holds door in closed position.
- L. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

END OF SECTION 23 31 00

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Backdraft dampers.
- C. Combination fire and smoke dampers.
- D. Duct access doors.
- E. Duct test holes.
- F. Fire dampers.
- G. Flexible duct connections.
- H. Smoke dampers.
- I. Volume control dampers.

1.2 REFERENCES

- A. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.
- B. NFPA 92A - Standard on Smoke-Control Systems; National Fire Protection Association.
- C. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.
- D. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc.
- E. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc.
- F. UL 555S - Standard for Leakage Rated Dampers for Use in Smoke Control Systems; Underwriters Laboratories Inc.

1.3 SUBMITTALS

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

1.4 PROJECT RECORD DOCUMENTS

- A. Record actual locations of access doors, test holes, and all dampers.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

1.7 EXTRA MATERIALS

- A. Provide two of each size and type of fusible link.

PART 2 – PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

- A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.2 BACKDRAFT DAMPERS

- A. Gravity Backdraft Dampers, Size 18 x 18 inches (450 x 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

- A. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
- B. Provide factory sleeve and collar for each damper.
- C. Multiple Blade Dampers: Fabricate with 16 gage (1.5 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch (3.2 x 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.
- D. Operators: UL listed and labeled spring return electric type suitable for 120 volts, single phase, 60 Hz. Locate damper operator on exterior of duct and link to damper operating shaft.

- E. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices.
- F. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.4 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Access doors with sheet metal screw fasteners are not acceptable.

2.5 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.6 FIRE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- B. Ceiling Dampers: Galvanized steel, 22 gage (0.76 mm) frame and 16 gage (1.5 mm) flap, two layers 0.125 inch (3.2 mm) ceramic fiber on top side with locking clip.
- C. Horizontal Dampers: Galvanized steel, 22 gage (0.76 mm) frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabricblanket.
- D. Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

2.7 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd (1.0 kg/sq m).
 - a. Net Fabric Width: Approximately 2 inches (50 mm).
 - 2. Metal: 3 inches (75 mm) wide, 24 gage (0.6 mm) thick galvanized steel.
- C. Leaded Vinyl Sheet: Minimum 0.55 inch (14 mm) thick, 0.87 lbs per sq ft (4.2 kg/sq m), 10 dB attenuation in 10 to 10,000 Hz range.

2.8 SMOKE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
- B. Dampers: UL Class 1 curtain type fire damper, normally open automatically operated by electric actuator.
- C. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.9 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch (150 x 760 mm).
- C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch (200 x 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- D. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- E. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches (750 mm) provide regulator at both ends.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 233100 for duct construction and pressure class.
- B. Provide back draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch (200 x 200 mm) size for hand access, 18 x 18 inch (450 x 450 mm) size for shoulder access, and as indicated. Provide 4 x 4 inch (100 x 100 mm) for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.
- G. Demonstrate re-setting of fire dampers to Owner's representative.
- H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- K. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION 23 33 00

SECTION 23 37 00 - AIR OUTLETS AND INLETS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.
- C. Louvers.

1.2 REFERENCES

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.
- B. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

1.3 SUBMITTALS

- A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- B. Project Record Documents: Record actual locations of air outlets and inlets.

1.4 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.

PART 2 – PRODUCTS

2.1 ROUND CEILING DIFFUSERS – See Drawings

2.2 RECTANGULAR CEILING DIFFUSERS – See Drawings

2.3 CEILING EXHAUST AND RETURN REGISTERS/GRILLES – See Drawings

2.4 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES – See Drawings

2.5 LOUVERS

- A. Type: 4 inch (100 mm) deep with blades on 45 degree slope, heavy channel frame, 1/2 inch (13 mm) square mesh screen over exhaust and 1/2 inch (13 mm) square mesh screen over intake.
- B. Fabrication: 16 gage (1.50 mm) thick galvanized steel welded assembly, with factory baked enamel finish, color to be selected.
- C. Mounting: Furnish with screw holes in jambs for installation.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION 23 37 00

SECTION 23 76 55 - SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Air-source heat pumps and cooling units.
- B. Air cooled condensing units.
- C. Indoor air handler (fan & coil) units for non-ducted and ducted connections.

1.2 REFERENCES

- A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning and Refrigeration Institute.
- B. ARI 520 - Positive Displacement Condensing Units; Air-Conditioning and Refrigeration Institute.
- C. ASHRAE Std 23 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- D. ASHRAE Std 90.1 - Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- E. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- F. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.
- G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.

1.3 SUBMITTALS

- A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- C. Design Data: Indicate refrigerant pipe sizing.

- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E. Project Record Documents: Record actual locations of components and connections.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

PART 2 - PRODUCTS

2.1 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.
 - 1. Efficiency: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1 as indicated on drawings; seasonal efficiency to ASHRAE Std 103.
- C. Electrical Characteristics:
 - 1. Disconnect Switch: Provided under Division 26.

2.2 INDOOR UNITS FOR DUCTED SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
 - 1. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
- C. Air Filters: 1 inch (25 mm) thick urethane, washable type arranged for easy replacement.
- D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with ARI 210/240 and UL listed.
 - 2. Manufacturers: System manufacturer.

- E. Furnaces: UL listed and manufactured integral to air handling unit at listed capacities on schedules.

2.3 INDOOR UNITS FOR DUCTLESS SYSTEMS

- A. Ceiling Cassette Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer. Four-way 2'x2' ceiling-cassette indoor unit with built-in drain pump mechanism for condensate removal. Low Ambient cooling capability to 0 degrees F and reverse cycle heating capability as specified. Wide air-flow pattern with ventilation air intake knockout. Air filter included with unit. Indoor unit powered from outdoor unit with control transformer. Automatic fan speed control; auto restart following a power outage. Auto wave airflow in heating mode—unit independently cycles through horizontal and vertical positions for more even heat distribution.
- B. Indoor Wall Mounted Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer. Wall mounted indoor unit with built-in drain pump mechanism for condensate removal. Low Ambient cooling capability to 0 degrees F and reverse cycle heating capability where specified in heat pump configuration. Air filter included with unit. Indoor unit powered from outdoor unit with control transformer. Auto restart following a power outage.
- C. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with ARI 210/240 and UL listed.

2.4 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
 - 2. Construction and Ratings: In accordance with ARI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.
- B. Compressor: ARI 520; hermetic, two speed 1800 and 3600 rpm, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.
- C. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion and reversing valves for heat pump operation.

D. Operating Controls:

1. Control by room thermostat to maintain room temperature setting. Thermostat shall allow occupied and unoccupied settings from BAS and have an occupied mode override. Provide outdoor coil defrost control. Unit shall be capable of operating with automatic changeover in cooling or reverse cycle heating, and auxiliary heating modes.

E. Unit shall be capable of operating to 0 degrees F.

2.5 AUXILIARY HEAT/ELECTRIC FURNACE COMPONENTS

- A. Electric Heater: Helix wound bare nichrome wire heating elements arranged in incremental stages of 5 kW each, with porcelain insulators.

B. Operating Controls:

1. Heater stages energized in sequence with pre-determined delay between heating stages.
2. High limit temperature control to de-energize heating elements, with automatic reset.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with NFPA 90A and NFPA 90B.

END OF SECTION 23 76 55

SECTION 26 05 00 - ELECTRICAL GENERAL PROVISIONS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Provide all materials, labor, and equipment required to furnish and install a complete electrical system as indicated on the Drawings and as specified herein.
- B. Electrical work includes, but is not limited to, the following:
 - 1. Electrical distribution system for lighting and power including the electrical service and necessary feeders, panelboards, branch circuits, conduit, lighting fixtures, control switches, and receptacles.
 - 2. Excavation, trenching, and backfilling for conduit and/or cable.
 - 3. Grounding.
 - 4. Power wiring for equipment furnished under Division 21, 22, and 23

1.2 RELATED WORK

- A. The following work shall be furnished under other Divisions of these Specifications, but shall be coordinated with said Divisions by Division 26 tradesman prior to bid.
 - 1. Painting.
 - 2. Cutting and patching.
 - 3. Heating, ventilating, air conditioning, and plumbing equipment.

1.3 DEFINITIONS

- A. Provide: Shall mean "furnish, install, connect, and put in good working order."
- B. Wiring: Shall mean "wire and cable, installed in raceway with all required boxes, fittings, connectors, etc. completely installed."
- C. Engineer: Shall mean "Engineer of Record" whose seal is affixed to the contract specifications and drawings of Division 26.

1.4 CODES AND STANDARDS

- A. Comply with applicable local, state, and federal codes.
- B. Electrical work shall be installed in accordance with the Drawings and Specifications, the 2012 IBC, 2011 NEC, ANSI, and NFPA.
- C. In event of conflict between Drawings, Specifications and such codes, Engineer shall be notified in writing prior to bid. A ruling will then be made by the Engineer in writing. All work shall be installed in strict accordance with applicable codes without additional cost to Owner.

- D. Contractor shall submit and/or file all necessary specifications and drawings as required by governing authorities.

1.5 SUBMITTALS

- A. Provide submittals on materials and equipment identified in the Specifications and Drawings prior to manufacturer, order, or installation in accordance with Shop Drawings, Product Data, and Samples.
- B. Submittals shall include but not be limited to the following: Lighting fixtures, Panelboards and Safety switches

1.6 OPERATING AND MAINTENANCE MANUALS

- A. Furnish, to the Owner, three bound and indexed sets of operation and maintenance instructions on the electrical equipment. Instructions shall also include recommended spare parts lists.
- B. A minimum of 4 hours of training on the operation and maintenance of the electrical equipment shall be provided for the Owner's representative.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment and materials to job site in original, unopened, labeled containers.
- B. Store ferrous materials to prevent rusting. Store finished materials and equipment to prevent staining and discoloring.

PART 2 – PRODUCTS (Not used) PART 3 -

EXECUTION

3.01 SITE VISIT

- A. Visit job site prior to bid date to determine actual conditions under which work shall be done, to become familiar with project, and to verify total scope of work required. Failure to do so shall not constitute a reason for an extra charge.

END OF SECTION 26 05 00

SECTION 26 05 01 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.01 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: All materials and equipment used in work of Division 26 shall be produced by manufacturers regularly engaged in manufacturer of similar items and with history of successful production acceptable to the Engineer. They shall be new and be UL listed and labeled or listed and labeled by other recognized testing laboratory where such label is available.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work of this Section.

PART 2 – PRODUCTS

2.01 SUBSTITUTIONS

- A. Reference in Specifications to any article, device, product, material, fixture, form and type of construction, by name, make, or catalog number shall be interpreted as established standard of quality and shall not be construed as limiting competition unless noted otherwise. Any article, device, product, material, fixture, form and type of construction which in the judgment of Engineer, expressed in writing, is equal to that specified, may be used.
- B. Substitution shall be approved by Engineer before purchase and/or installation. If unapproved materials are installed, work required to remove and replace unapproved items shall be done at the Contractor's expense.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Electrical drawings are diagrammatic and shall not be scaled for exact sizes or locations. They are not intended to disclose absolute or unconditional knowledge of actual field conditions. This Division shall be prepared to relocate any outlet or device 6' in any direction without additional charge to the Owner.
- B. Equipment shall be installed according to manufacturer's recommendations.
- C. Protect work and materials from damage by weather, entrance of water, and dirt. Cap conduit during installation. Avoid damage to materials and equipment in place.
- D. Satisfactorily repair or remove and replace damaged work with new materials.

- E. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available space in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring services shall be readily accessible.

- F. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate electrical systems, equipment, and materials installation with other building components.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
 - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 - 5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 - 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 - 7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.
 - 8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, whether exposed or concealed.
 - 9. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
 - 10. Install access panels or doors where units are concealed behind finished surfaces.
 - 11. Insulate dissimilar metals so they are not installed in direct contact.

- H. Conduits which pass through floor slabs (except ground floor) shall be sealed with Fire Stop Sealant. Seal around conduits or other wiring materials passing through partitions, floors, and fire rated walls. Use UL approved Fire Stop Sealant as detailed on the drawings.

- I. Coordinate electrical power connection requirements with all equipment suppliers. Where power requirements differ from drawing design requirements, Engineer shall be notified for clarification and installation requirements prior to installing that portion of work. Cost for equipment and labor for improperly installed electrical connections not coordinated and approved by other trades and the Engineer shall be incurred by the Electrical Contractor and shall not constitute a reason for an extra charge because of rework.

3.2 CUTTING AND PATCHING

- A. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

3.3 TESTING AND EQUIPMENT SERVICING

- A. Entire installation shall be free from improper grounds and short or open circuits. Conductors shall be tested before energizing circuit. Test to insure that entire system is in proper operating condition, and that adjustments and setting of circuit breakers, fuses, control equipment, and apparatus have been made. Correct defects discovered during tests.
- B. Equipment shall be turned over to Owner in lubricated condition with instructions on further lubrication included in operating instructions.

3.4 REMOVAL OF DEBRIS

- A. Remove surplus materials and debris caused by, or incidental to electrical work. Remove such debris at frequent intervals. Keep job site clean during construction.

3.5 IDENTIFICATION OF EQUIPMENT

- A. Equipment shall be identified in accordance with Section 260553, "Electrical Identification."

3.6 AS-BUILT DRAWINGS

- A. Maintain one set of blue line electrical prints on site, marked to show as-built conditions and installations, prints to be turned over to Owner after job is complete.

3.7 TEMPORARY LIGHTING AND POWER

- A. Provide, maintain and remove after construction is completed, temporary lighting adequate for workman safety and temporary power for all trades.

3.8 OTHER MATERIALS

- A. Work of this Division shall also include those items not specifically mentioned or described, but which are obviously necessary to conform to the design intent, applicable codes and to produce complete electrical system that functions properly. These materials shall be as selected by Contractor but subject to approval of the Engineer.

3.9 OTHER COORDINATION

- A. Contractor shall obtain and pay for all necessary permits and inspection fees required for the electrical installation.

B. All utility company (KUB) aid to construction fees shall be included in the bid.

3.10 GUARANTEE-WARRANTY

A. Guarantee work to be free of material and workmanship defects for a period of one year, from date of final acceptance for the project. Repair and replace defective work and other work damaged thereby which becomes defective during term of Guarantee- Warranty. Furnish Owner with three written copies of Guarantee-Warranty.

END OF SECTION 26 05 01

SECTION 26 05 19 - WIRE AND CABLE

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Wire and cable for all service, feeders, branch circuits, and instrument and control wiring rated 600 volts and below.

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wire and cable that is listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Wire and cable and its installation shall comply with requirements of the National Electrical Code.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Wires and cables shall meet applicable requirements of the National Electrical Code and UL for the type of insulation, jacket, and conductor specified or indicated.
- B. All conductors shall be copper with 600 volt insulation unless otherwise indicated.
- C. Wire and cable shall be manufactured by Belden, General Cable, Essex, Encore, Rome Cable, Southwire, or approved equal.
- D. Use solid copper type THHN/THWN for branch circuit wiring #10 AWG and smaller. No conductor for branch circuit wiring shall be smaller than #12 AWG.
- E. Use stranded copper, type THHN/THWN for feeder and power circuits #8 AWG and larger.
- F. Provide color coded wire and with a different color for each phase and neutral and ground as follows: 240/120 volt circuits - phases A and B: black and red, respectively; neutral: white; ground: green. Approved color tape is acceptable for feeders. The neutral shall have a stripe to match the corresponding phase conductor color. Also provide color coded wire for control circuits.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Complete conduit system before pulling any wire or cable. Use cable lubricants recommended by cable manufacturer as necessary.
- B. Conductors shall be continuous from outlet to outlet or to branch circuit over-current devices. Make splices only in junction boxes. Splices shall not be made in panelboards. Control wiring shall be continuous between components and/or terminal boards.
- C. A minimum of eight (8") inches of slack conductor shall be left in every outlet or junction box. There should also be enough slack so three (3") inches extends outside the outlet or junction box.
- D. Make splices in conductors #10 AWG and smaller diameter with insulated, pressure- type connector. Use Scotchlok, Ideal, or equal wire connectors.
- E. Make splices in conductors #8 AWG and larger diameter with solderless connectors and cover with insulation material equivalent to conductor insulation. Use Burndy compression connectors with crimp cover, type CC, or equal.
- F. Where branch circuits homeruns exceed 70' in length for 120 volt and 150' in length for 240 volt circuits, #10 AWG wire shall be the minimum size used to the first outlet.

3.02 TESTING

- A. After completion of the installation and splicing and prior to energizing the conductors, wire and cable shall be given continuity and insulation tests as herein specified.
- B. Test wiring to verify that no short circuits, open circuits, or accidental grounds exist. Continuity tests shall be conducted using a dc device with bell or buzzer.
- C. All conductors number 4 and larger shall be Megger tested.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

1.2 PERFORMANCE REQUIREMENTS

- A. The grounding system to earth resistance shall be less than 25 ohms.

1.3 QUALITY ASSURANCE

- A. Listing and Labeling: Provide grounding and bonding materials that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Components and installation shall comply with the requirements of the National Electrical Code (NEC).
- C. Materials shall comply with UL 467, "Grounding and Bonding Equipment." PART

2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers shall be Burndy, T&B, or approved equal.

2.2 GROUNDING ELECTRODES

- A. Ground rods shall be copper clad steel with minimum dimensions of ¾ inch diameter by 10 feet long.

2.3 CONNECTORS

- A. Exothermic welded connections shall be provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.
- B. Pressure connectors shall be high-conductivity-plated units.

- C. Bolted clamps shall be heavy-duty units listed for the application.

2.4 WIRE AND CABLE

- A. All grounding conductors shall be copper.
- B. The grounding electrode conductor shall be stranded.
- C. Equipment grounding conductors shall have green insulation.
- D. Bare copper conductors shall conform to the following:
 - 1. Solid conductors: ASTM B-3
 - 2. Assembly of stranded conductors: ASTM B-8
 - 3. Tinned Conductors: ASTM B-33

2.5 MISCELLANEOUS CONDUCTORS

- A. Ground bus shall be bare annealed copper bars.
- B. Braided bonding jumpers shall be copper tape, braided number 30 gauge bare copper wire, and terminated with copper ferrules.
- C. Bonding strap conductor/connectors shall be soft copper, 0.05 inch thick and two (2") inches wide, unless otherwise noted.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Grounding system shall be in accordance with Article 250 of the NEC except where the Drawings or Specifications exceed NEC requirements.
- B. Install code size green grounding conductors in all feeder and branch circuits. Bond conductors to chassis or fixed equipment.
- C. All grounding conductors shall be bonded to multi-terminal ground bus at panelboard or other distribution equipment. Grouping of grounding conductors under a single lug is not acceptable.
- D. Bond interior metal piping systems.
- E. Bond reinforcing steel in foundation footing to grounding electrode conductor. Bond steel together.
- F. Install a single ground rod at each building and connect to the grounding electrode system.

- G. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.

3.2 CONNECTIONS

- A. Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
 - 2. Make connections with clean bare metal at points of contact.
 - 3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.
 - 4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
- B. Use exothermic welded connections for connections to structural steel and for underground connections. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. For compression-type connections, use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.
- D. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.
- E. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.
- F. Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.

- G. Do not use flexible metal conduit and fittings as a grounding means. Pull a green wire in each piece of flexible conduit, and screw to conduit system with lugs at both ends.

3.3 FIELD QUALITY CONTROL

- A. Use the fall-of-potential method as described in IEEE Standard 81 to measure the resistance of the following. Record the measurements and provide to the Engineer.
The resistance between earth and each ground rod prior to interconnection with other ground rods.
 1. The resistance between earth and the counterpoise.
 2. The resistance of the grounding system at the grounding electrode connection to earth.
Measure the ground resistance when there has been no precipitation for 5 days, without the soil being moistened by any means other than natural precipitation or natural drainage or seepage, and without chemical treatment or other artificial means of reducing natural ground resistance.
 3. Resistance shall be less than 25 ohms.

- B. Perform continuity tests at all power receptacles to ensure the ground terminals are properly grounded to the facility ground network.

END OF SECTION 26 05 26

SECTION 26 05 29 - SUPPORTING DEVICES

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fasteners.

1.2 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with the National Electrical Code.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, Slotted Metal Angle and U-Channel Systems shall be provided by Allied Tube & Conduit, American Electric, B-Line Systems, Inc., Unistrut Diversified Products, or approved equal.
- B. Subject to compliance with requirements, Conduit Sealing Bushings shall be provided by Bridgeport Fittings, Inc., Cooper Industries, Inc., Killark Electric Mfg. Co., O- Z/Gedney, Raco, Inc., Spring City Electrical Mfg. Co., Thomas & Betts Corp., or approved equal.

2.2 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be aluminum or hot-dip galvanized.

2.3 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Raceways shall be supported with clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners: Types, materials, and construction features as follows:
 - 1. Expansion Anchors: Carbon steel wedge or sleeve type.
 - 2. Toggle Bolts: All steel springhead type.
 - 3. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.

- C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.
- E. U-Channel Systems: 16-gauge steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer.

2.4 FABRICATED SUPPORTING DEVICES

- A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
 - 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
 - a. 3-inch and smaller: 20-gauge.
 - b. 4-inch to 6-inch: 16-gauge.
 - c. over 6-inch: 14-gauge.
 - 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
 - 3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installation.
- C. Raceway Supports: Comply with the NEC and the following requirements:
 - 1. Conform to manufacturer's recommendations for selection and installation of supports.

2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs., provide additional strength until there is a minimum of 200 lbs. safety allowance in the strength of each support.
 3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
 5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
 6. Space supports for raceway types not covered by the above in accordance with NEC.
 7. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
 8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- D. Vertical Conductor Supports: Install simultaneously with installation of conductors.
- E. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- F. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- G. Sleeves: Install in concrete slabs and walls and all other fire rated floors and walls for raceways and cable installations. For sleeves through fire rated wall or floor construction, apply UL listed firestopping sealant in gaps between sleeves and enclosed conduits and cables in accordance with manufacturer's recommendations.
- H. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

- I. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:
 1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
 2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
 3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.

END OF SECTION 26 05 29

SECTION 26 05 34 – CONDUIT

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Provide a conduit system for building wire/conductors where specifically noted on the plans. Conduit system includes conduit, couplers, connectors, fittings, boxes, covers and supports.

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide conduit that is listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Conduit and its installation shall comply with requirements of the National Electrical Code.

PART 2 – PRODUCTS

2.1 CONDUIT

- A. Electric Metallic Tubing (EMT): Allied, Wheatland, LTV Copperweld, or approved equal.
- B. Rigid Metal Conduit (RMC): Allied, Wheatland, Republic, or approved equal.
- C. Flexible Steel Conduit (Greenfield): Alfex, Electroflex, or approved equal.
- D. Rigid Non-Metallic Conduit (PVC): Carlon Schedule 40, Cantex, Southern Pipe, Schedule 80 or approved equal.
- E. Liquidtight Flexible Nonmetallic Conduit (LFNC): Aflex, Electroflex, or approved equal.

2.2 CONDUIT FITTINGS

- A. Couplings and connectors: Appleton, T&B, Arlington, or O.Z. Gedney.
- B. Bushings: Appleton, T&B, O.Z., or Gedney
- C. Straps and Hangers: Appleton, T&B, Steel City, or Minerallac.
- D. Group Pipe supports: Unistrut, Kindorf, B-Line, or approved equal.
- E. Expansion Fittings: O.Z. Gedney Type AX, or equal by Appleton, or approved equal.
- F. Exposed Conduit Fittings: Appleton, Crouse-Hinds, or O.Z. Gedney.

PART 3 – EXECUTION

3.1 CONDUIT

- A. In general, conduit installation shall follow layout shown on drawings. However, this layout is diagrammatic only and where changes are necessary due to structural conditions, other apparatus or other causes, such changes shall be made without cost to Owner. Offsets in conduits are not indicated and must be furnished as required.
- B. Conduit shall be installed in accordance with the National Electrical Code.
- C. Provide bushings on the open ends of conduit containing conductors. Insulated bushings shall be provided for conduits containing conductors #4 AWG or larger with an insulating ring an integral part of the bushing.
- D. Use EMT where Drawings call for conduit to be concealed in walls or above ceilings. Do not use EMT in wet locations or in exterior applications.
- E. Use Schedule 40 PVC encased in concrete or when run underground. Use Schedule 80 PVC when exposed.
- F. When conduit is turned up, penetration of the slab shall be vertical. The entire radius of the conduit shall be below slab.
- G. Support conduit and secure to forms when cast in concrete so that conduit will not be displaced during pouring of concrete. Stuff boxes and cork fittings to prevent entrance of water during concrete pouring and at other times during construction, prior to completion of conduit installation.
- H. Route all conduit at right angles or parallel to walls of building.
- I. Use proper sized tools for bending. Do not heat metal conduit. Dents and flat spots will be rejected. Cut and thread conduit so ends will butt in couplings. Make threads no longer than necessary and ream pipe free of burrs.
- J. Leave one #10 AWG or equivalent nylon pull wire in empty conduits.
- K. Use short pieces, approximately five (5') feet of flexible conduit to connect motors and other devices subject to motion and vibration. Use liquidtight flexible conduit where outside or subject to water spray.

3.2 CONDUIT FITTINGS

- A. When EMT is installed concealed in walls or above ceilings, for sizes one (1") inch and smaller use set screw connectors and steel couplings with two set screws. For sizes larger than one (1") use steel double set screw connectors and steel couplings with four set screws. All connectors shall have throated insulating bushing.
- B. Support conduit vertically and horizontally by straps or hangers. Do not exceed intervals as described in the National Electrical Code.
- C. Use expansion fittings, properly bonded to assure ground continuity, across expansion joints in floors and ceilings. Use double lock nuts and bushings on panel feeders at panel cans.

END OF SECTION 26 05 34

SECTION 26 05 37 - OUTLET AND JUNCTION BOXES

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide outlet and junction boxes that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Outlet and junction boxes and their installation shall comply with the requirements of the National Electrical Code.

PART 2 – PRODUCTS

2.01 OUTLET AND JUNCTION BOXES

- A. Outlet and junction boxes shall be plastic, 1-1/2" deep minimum by Raco, T&B/Steel City, Crouse Hinds or approved equal. Use 2 hour rated plastic boxes in rated walls.

PART 3 – EXECUTION

3.1 GENERAL

- A. Outlet and junction boxes in inaccessible ceiling areas shall be located no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- B. Install boxes to preserve fire resistance rating of partitions and other elements, using UL listed fire stop materials and methods.
- C. Do not install flush mounted boxes back-to-back in walls; provide minimum six (6") inches separation. Provide minimum twenty-four (24") inches separation in fire rated walls.
- D. Bonding jumpers shall be used around concentric knockouts.

3.2 OUTLET BOXES

- A. Outlet boxes shall be securely anchored, set true, and plumb and no part of box shall extend beyond finished wall or ceiling. Flush mounted boxes shall be set to within 1/8" of finished wall and a plaster ring used to make cover flush with wall.
- B. Select boxes according to intended use and type of outlet. Ceiling outlet boxes shall be four (4") inches octagon and 2-1/2" deep. Use four (4") inches square boxes where required. All ceiling outlet boxes shall have a fixture stud of the no bolt, self- locking type if required to hang the fixture specified at the outlet.
- C. Install blank device plates on outlet boxes left for future use.
- D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices. Confirm accessibility code compliance.

3.3 JUNCTION BOXES

- A. Pull and junction boxes shall be sized in accordance with the National Electrical Code according to number of conductors in box or type of service to be provided. Minimum size is 4-11/16" square and 2-1/2" deep.
- B. Pull boxes shall be provided where necessary in the conduit system to facilitate conductor installation. Conduit runs longer than 100 feet or with bends exceeding 270 degrees shall have a pull box installed at a convenient intermediate location.
- C. Install in locations as shown on Drawings and as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.
- D. Install pull and junction boxes above accessible ceilings and in unfinished areas only.

3.4 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused box openings.

3.5 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION 26 05 37

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Extent and types of electrical identification are indicated herein and as follows:
 - 1. Operational instructions and warnings.
 - 2. Danger signs.
 - 3. Equipment/system identification signs.
 - 4. Conduit identification.
 - 5. Power and control wiring identification.
 - 6. Terminal marking.
 - 7. Arc-flash warning.
 - 8. Panelboard Legends.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, identification products shall be provided by W.H. Brady Co., Ideal Industries, Inc., Panduit, T&B, or approved equal.

2.2 MATERIALS

- A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.
- B. Cable/Conductor Identification Bands: Provide manufacturer's standard wrap-around type, vinyl-cloth, self-adhesive cable/conductor markers with either pre-numbered plastic coated type or write-on type with clear plastic self-adhesive cover flap, numbered to show circuit identification. Provide markers for all field control wiring.
- C. Self-Adhesive Plastic Signs: Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings. Signs shall be of sizes suitable for application areas and adequate for visibility, with proper wording for each application (as examples: 208V, EXHAUST FAN or DANGER – HIGH VOLTAGE).
 - 1. Colors: Unless otherwise indicated or required by governing regulations, provide orange signs with black lettering.
- D. Engraved Plastic-Laminate Signs: Provide three-layer engraving stock in sizes and thickness indicated, engraved with engraver's standard letter style of sizes and wording indicated, black and white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

1. Thickness: 1/16", for units up to 20 sq. in. or eight (8") length; 1/8" for larger units.
2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

E. Underground Warning Tape: Provide four (4") inch wide detectable type, plastic, yellow warning tape with suitable warning describing type of cable/circuit over buried electrical lines.

2.3 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations, and other designations used in electrical identification work, with corresponding designations shown, specified, or scheduled. Provide numbers, lettering, and working as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 – EXECUTION

3.01 APPLICATION AND INSTALLATION

A. General Installation Requirements:

1. Coordination: Where identification is to be applied to surfaces, which require finish, install identification after completion of painting.
2. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.
3. Equipment/System Identifications: Install engraved plastic-laminate sign on each disconnect and enclosure. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide identification and warning signs for each unit of the following categories of electrical work.
 - a. Panelboards
 - b. Disconnect switches.

B. Install signs at locations indicated or, where not otherwise indicated, at locations for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with stainless steel tamperproof fasteners.

C. Install magnetic/traceable underground warning tape in accordance with the National Electrical Code.

END OF SECTION 26 05 53

SECTION 26 05 73 - OVERCURRENT PROTECTIVE DEVICES

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. This section includes circuit breakers and fuses.

1.2 SUBMITTALS

- A. Provide manufacturer's product data for the following:
 - 1. Circuit breakers
 - 2. Enclosures
 - 3. Fuses (Provide complete list of all fuses and the equipment where they are used.)
 - 4. Shunt trips
- B. Provide maintenance data for products for inclusion in the Operating and Maintenance Manual.
 - 1. Include a load current and overload relay heater list compiled by Contractor after motors have been installed. Arrange list to demonstrate selection of heaters to suit actual motor nameplate full load currents.

1.3 QUALITY ASSURANCE

- A. Listing and Labeling: Provide overcurrent protective devices that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Overcurrent protective devices and their installation shall comply with the requirements of the National Electrical Code.
- C. Circuit breakers shall comply with UL 489, NEMA AB 1, and NEMA AB3.
- D. Fuses shall conform to NEMA FU 1.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Circuit Breakers: Subject to compliance with requirements, provide products by Cutler-Hammer; General Electric Co.; Siemens Energy & Automation, Inc.; Square D Co.; or approved equal.
- B. Fuses: Subject to compliance with requirements, provide products by Bussmann Mfg. Co., Littlefuse Co, Ferraz Shawmut, or approved equal.

2.2 FUSES

- A. A complete set of fuses for all switches shall be provided. Fuses shall have a voltage rating not less than the circuit voltage.
- B. Provide Class RK1 fuses for motor branch circuits.
- C. Fuses shall be labeled showing UL class, interrupting rating, and time-delay characteristics, when applicable.
- D. Fuse holders field-mounted in a cabinet or box shall be porcelain. Field installation of fuse holders made of such materials as ebony asbestos, Bakelite, or pressed fiber shall not be used.

2.3 EQUIPMENT ENCLOSURES

- A. Enclosures for equipment shall be in accordance with NEMA 250.
- B. Equipment installed inside, clean, dry locations shall be contained in NEMA Type 1, general-purpose sheet-steel enclosures.
- C. Equipment installed in wet locations shall be contained in NEMA Type 3R, rainproof, sheet-steel enclosures, constructed for outdoor use to protect against falling rain, sleet, and ice.
- D. Ferrous-metal surfaces of electrical enclosures shall be cleaned and painted with the manufacturer's standard finish.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install overcurrent protective devices as indicated or required, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements.
- B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices.
- C. Install enclosed circuit breakers plumb with operating handle at five (5') feet above finished elevation.
- D. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of devices.
- E. Provide engraved plastic-laminate nameplates under the provisions of Section 260553, "Electrical Identification" for enclosed circuit breakers and motor controllers.

3.2 ADJUSTING

- A. Inspect circuit breaker operating mechanisms for malfunctioning and where necessary, adjust units for free mechanical movement.

3.3 FIELD QUALITY CONTROL

- A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION 26 05 73

SECTION 26 24 16 - PANELBOARDS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Lighting and appliance panelboards (loadcenters). All 240/120Volt, 1 Phase panels.

1.2 REFERENCES

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association.
- C. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association.
- D. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association.
- E. NFPA 70 - National Electrical Code; National Fire Protection Association;

1.3 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.4 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.5 MAINTENANCE MATERIALS

- A. Furnish two of each panelboard key.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Eaton Electrical/Cutler-Hammer
- B. GE Industrial
- C. Square D
- D. GE

2.2 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard. Unit shall be similar to Square D. Co. NQOB Series.
- B. Panelboard Bus: Copper, ratings as indicated. Provide aluminum ground bus in each panelboard; provide insulated ground bus where scheduled.
- C. Minimum Integrated Short Circuit Rating: As indicated.
- D. Cabinet Box: 4 inches (153 mm) deep, 14 inches (508 mm) wide.
- E. Cabinet Front: Flush cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.
- B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- C. Height: 6 feet (1800 mm) to top of panelboard; install panelboards taller than 6 feet (1800 mm) with bottom no more than 4 inches (100 mm) above floor.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed or circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- F. Provide engraved plastic nameplates under the provisions of Section 260553.
- G. Ground and bond panelboard enclosure according to Section 260526.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES AND PLATES

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Switches
- B. Receptacles
- C. Plates

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wiring devices and plates that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Wiring devices and plates and their installation shall comply with the requirements of the National Electrical Code.

PART 2 – PRODUCTS

2.1 SWITCHES

- A. Switches shall be toggle, quiet-type with totally enclosed with bodies of thermoplastic and mounting strap.
- B. Switches shall be rated for 20 amps, 277 volts AC. Switches shall be specification grade Hubbell, P&S, Leviton, Cooper Wiring Devices, or approved equal.

2.2 RECEPTACLES

- A. Receptacles shall be general purpose, heavy duty, duplex receptacles of thermoplastic supported on a metal mounting strap in accordance with NEMA WD 1. Receptacles shall be 20 amp, 125 volt, specification grade Cooper Wiring Devices, Hubbell, Leviton, P&S.
- B. Ground fault circuit interrupter receptacles shall be the "feed-through" type rated to protect 20 amps. Receptacles shall be specification grade duplex receptacles with impact-resistant nylon face with test and reset buttons.
 - 1. 20 Amp, 125 Volt: Cooper Wiring Devices, Hubbell, Leviton, P&S, or approved equal.
- C. All devices shall be tamper and/or weather resistance where required by the NEC.

2.3 PLATES

- A. Provide UL listed, one-piece device plates to suit the devices installed.
- B. Plates on finished walls shall be mid-size, nylon.
- C. Plates shall be same color as receptacle or toggle switch with which they are mounted. Screws shall be machine-type with countersunk heads in color to match finish of plate.
- D. Plates installed in wet locations shall be gasketed and UL listed for "wet locations" as per 2005 NEC 406.8 (B).

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Provide proper size outlet boxes for all wiring devices in accordance with Section 260537, "Outlet and Junction Boxes."
- B. Install switches forty-eight (48") inches above finished floor on lock side and clear of door frame a minimum of three (3") inches unless otherwise noted. Prior to rough-in, coordinate with architectural drawings to determine lockside of door.
- C. All switches shall be made by the same manufacturer.
- D. Where two or more snap switches are to be installed at the same location, they shall be mounted in one-piece ganged switch boxes, with at gang cover plate.
- E. Combination snap switch and single or duplex receptacles shall be mounted in two-gang switch box with one-piece device plate.
- F. Receptacles shall be mounted 18" above finished floor unless otherwise noted.
- G. All wiring devices shall be mounted in accordance with accessibility code requirements.
- H. Verify the finish color of all devices and cover plates with architect/owner.

END OF SECTION 26 27 26

SECTION 26 28 18 - DISCONNECT SWITCHES

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Fused Disconnect Switches

1.2 SUBMITTALS

- A. Provide product data showing switch's ratings and enclosure type.

1.3 QUALITY ASSURANCE

- A. Listing and Labeling: Provide disconnect switches that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Disconnect switches and their installation shall comply with the requirements of the National Electrical Code.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Switches shall be Square D, Cutler-Hammer/Eaton, General Electric, Siemens Energy & Automation, or approved equal.

2.2 MATERIALS

- A. Use standard duty, pull-out type switches.
- C. Provide equipment ground lug in each switch.
- D. Provide NEMA 1 enclosures for interior installations, unless otherwise noted.
- E. Provide NEMA 3R enclosures for exterior installations or in wet locations, unless otherwise noted.
- F. Provide fuses as per equipment manufacturer recommendation.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Provide safety switches sized as indicated on the Drawings.
- B. Mount individually enclosed switches plumb and level with top four (4') feet above floor or grade, unless otherwise noted.
- C. Provide a set of fuses in fusible disconnect switches, as per equipment manufacturer recommendations.

3.2 IDENTIFICATION

- A. Identify disconnect switches in accordance with Section 260553, "Electrical Identification."

END OF SECTION 26 28 18

SECTION 31 13 16 – TREE PROTECTION AND TRIMMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. To improve as much as possible the chance for long-term survival of Five Points trees, the following minimum tree protection standards shall be followed during any exterior construction work performed on site including, but not limited to new building construction, utility construction and repair, road construction and repair, sidewalk construction, exterior building repairs, new roofs, and exterior HVAC work.
- C. All work outlined in this specification shall be performed under the direct supervision in the field by a certified arborist.

1.2 DEFINITIONS

- A. Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each type of protection-zone fencing.
- C. Arborists Certification: Submit credentials and current certifications of the arborist selected to perform all work as noted herein.
- D. Certification of Work Performed: Submit certification from arborist that existing trees to remain have been evaluated and given pre-construction care as deemed necessary by the arborist. Provide written verification that trees impacted by construction activities were property root pruned, canopy pruned, and treated.
- E. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- F. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1.4 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by ISA, licensed arborist in jurisdiction where Project is located, current member of ASCA, or registered Consulting Arborist as designated by ASCA.

1.5 PROJECT CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements:
 - 1. All existing trees, regardless of size, shall be temporarily fenced during construction. Fencing shall be installed prior to the start of work. Fencing shall be located at the edge of the root zone, or a distance equal to 15 times the diameter of the trunk in all directions. At no time shall the fencing be located closer than three feet away from the outside edge of the trunk in all directions. At no time shall the fencing be located closer than three feet away from the outside edge of the trunk. Fencing shall be a minimum of four feet tall. Fenced area shall not be used to store materials and/or equipment. Fenced areas shall not be used for parking, for dumping waste, or for any other use. Fencing shall be removed when Owner's Representatives have determined that construction is complete.
- B. Protection Fencing Materials:
 - 1. Fence fabric shall be high density laminar netting fence. Fabric shall be a uniform, square mesh pattern measuring approximately 2 inches its parallel sides. The color shall be orange.

2. Line, and corner posts shall be standard hardwood stakes. The stakes shall be new and shall be straight without bowing or cupping.
 3. Fence fabric shall be fastened to posts by means of No. 6 gauge zinc coated wire clips.
- C. Protection-Zone Signage: Shop-fabricated, rigid plastic with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.2 PROTECTION ZONES

- A. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

3.3 EXCAVATION

- A. General: All utility and drain lines should be located outside the root zone of all trees. Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 2 Section "Earthwork."
- B. Trenching near Trees: In the event that underground utilities encroach on the root zones of existing trees and alternative routes are not available and trenches are required within protection zones, hand excavate under or around tree roots or tunnel under major roots. Roots 2" or greater in diameter are considered major roots. Do not cut main lateral tree roots or taproots; cut only smaller roots (2" or less) that interfere with installation of utilities. Cut roots as required for root pruning. Utility lines must not be within six (6) feet of the tree trunk.
- C. Do not allow exposed roots to dry out before placing permanent backfill.

3.4 ROOT PRUNING

- A. Prune roots that are affected by temporary and permanent construction. Roots shall be protected using the following procedures.
 - 1. Have arborist observe and recommend the procedures for cutting, and pruning of roots.
 - 2. Cut roots manually by hand digging a trench to expose major roots 2" or greater in diameter. If major roots must be cut, cutting exposed roots shall be done with a saw or sharp pruning instruments to prevent jagged tearing; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 3. Temporarily support and protect roots from damage until they are permanently covered with soil.
 - 4. Place an absorbent tarp or heavy cloth over exposed roots and cover with 2"-4" of compost or mulch to prevent moisture loss. Water a minimum of twice weekly to maintain moisture.
 - 5. Backfill as soon as possible according to requirements in Division 2 Section "Earthwork."
- B. Root Pruning at Edge of Protection Zone: Prune roots by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.5 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:
 - 1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
 - 2. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
 - 3. Cut branches with sharp pruning instruments; do not break or chop.
 - 4. Do not apply pruning paint to wounds.
- B. Chip removed branches and dispose of off-site.

3.6 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

- C. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.7 FIELD QUALITY CONTROL

- A. Insert requirements for deeper fill if required. Measures must provide adequate aeration of feeder roots. Coordinate description with details on Drawings.

3.8 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Owner's Representative.
 1. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
 2. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
 3. Perform repairs within 24 hours.
 4. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Architect.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 13 16

SECTION 31 31 16 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wood treatment with termiticide.
 - 2. Bait-station system.
 - 3. Polymer barrier fittings with termiticide for installation around utility penetrations.

1.2 SUBMITTALS

- A. Product Data: For each type of termite control product.
 - 1. Include the EPA-Registered Label for termiticide products.
 - 2. Sustainable Design Submittal.
- B. Qualification Data: For qualified Installer.
- C. Product Certificates: For termite control products, from manufacturer.
- D. Wood Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:
 - 1. Date and time of application.
 - 2. Termiticide brand name and manufacturer.
 - 3. Quantity of undiluted termiticide used.
 - 4. Dilutions, methods, volumes used, and rates of application.
 - 5. Areas of application.
- E. Bait-Station System Application Report: After installation of bait-station system is completed, submit report for Owner's records and include the following:
 - 1. Location of areas and sites conducive to termite feeding and activity.
 - 2. Plan drawing showing number and locations of bait stations.
 - 3. Dated report for each monitoring and inspection occurrence indicating level of termite activity, procedure, and treatment applied before time of Substantial Completion.
 - 4. Termiticide brand name and manufacturer.
 - 5. Quantities of nontoxic termite bait used.
 - 6. Schedule of inspections for one year from date of Substantial Completion.
- F. Polymer Barrier Fittings with Termiticide Application Report: After installation of polymer barrier fittings with termiticide is completed, submit report for Owner's records and include the following:
 - 1. Plan drawing showing number and locations of each type of polymer barrier fitting with termiticide.
 - 2. Termiticide brand name and manufacturer.
 - 3. Schedule of inspections for one year from date of Substantial Completion.
- G. Warranties: Sample of special warranties.

1.3 QUALITY ASSURANCE

- A. **Installer Qualifications:** A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located, and who employs workers trained and approved by manufacturer to install manufacturer's products.
- B. **Regulatory Requirements:** Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.
- C. **Source Limitations:** Obtain termite control products from single source from single manufacturer.
- D. **Preinstallation Conference:** Conduct conference at Project site.

1.4 PROJECT CONDITIONS

- A. **Environmental Limitations:** To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
- B. Apply wood treatment after framing, sheathing, and exterior weather protection is completed but before electrical and mechanical systems are installed.
- C. Install bait-station system after construction, including landscaping, is completed.
- D. Install polymer barrier fittings with termiticide around utility penetrations prior to pouring concrete and after installation and inspection of plumbing and electrical pipes and conduits, slab vapor barrier, and concrete slab reinforcement.

1.5 WARRANTY

- A. **Wood Treatment Special Warranty:** Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of applied wood termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite damage is discovered during warranty period, repair or replace damage caused by termite infestation and treat replacement wood.
 - 1. **Warranty Period:** 12 years from date of Substantial Completion.
- B. **Polymer Barrier Fittings with Termiticide Special Warranty:** Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of installation of polymer barrier fittings with termiticide, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat and repair or replace damage caused by termite infestation.
 - 1. **Warranty Period:** Five years from date of Substantial Completion.

1.6 MAINTENANCE SERVICE

- A. Continuing Service: Beginning at Substantial Completion, provide 12 months' continuing service including monitoring, inspection, and re-treatment for occurrences of termite activity. Provide a standard continuing service agreement. State services, obligations, conditions, terms for agreement period, and terms for future renewal options.

PART 2 - PRODUCTS

2.1 WOOD TREATMENT

- A. Borate: Provide an EPA-Registered borate termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution for spray application and a gel solution for pressure injection, formulated to prevent termite infestation in wood. Provide quantity required for application at the label volume and rate for the maximum diffusible borate concentration allowed for each specific use, according to product's EPA- Registered Label.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Nisus Corp.; Bora-Care.
 - b. NovaGuard Technologies, Inc.; Armor-Guard.

2.2 BAIT-STATION SYSTEM

- A. Provide bait stations based on the dimensions of building perimeter indicated on Drawings, according to manufacturer's EPA-Registered Label for product, manufacturer's written instructions, and the following:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation, Agricultural Products; Subterfuge.
 - b. Dow AgroSciences LLC; Sentricon System.
 - c. Ensystem, Inc.; Exterra System.
 - d. FMC Corporation, Agricultural Products Group; First Line.
 - e. Whitmire Micro-Gen Research Laboratories, Inc.; Advance TBS.
 - 2. Provide number of bait stations recommended by the manufacturer.

2.3 POLYMER BARRIER FITTINGS

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. Syngenta; IMPASSE Termite Blockers.
- B. Pipe/Conduit Fitting: Integral 2-1/2-inch- long polymer sleeve and 1-inch- wide circular flange with lambda-cyhalothrin termiticide sealed between two outer polymer layers; with fasteners.
- C. Tub Trap Fitting: Integral polymer boot and 23-by-23-inch flange with lambda- cyhalothrin termiticide sealed between two outer polymer layers; with fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.
- B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

3.3 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING WOOD TREATMENT

- A. Application: Mix wood treatment solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of borate, according to manufacturer's EPA-Registered Label, so that wood framing, sheathing, siding, and structural members subject to infestation receive treatment.
 - 1. Framing and Sheathing: Apply termiticide solution by spray to bare wood for complete coverage.
 - 2. Wood Members More Than 4 Inches Thick: Inject termiticide gel solution under pressure into holes of size and spacing required by manufacturer for treatment.

3.5 INSTALLING BAIT-STATION SYSTEM

- A. Place bait stations according to the EPA-Registered Label for the product and manufacturer's written instructions, in the following areas that are conducive to termite feeding and activity:
 - 1. Conducive sites and locations indicated on Drawings.
 - 2. In and around infested trees and stumps.
 - 3. In mulch beds.
 - 4. Where wood directly contacts soil.
 - 5. Areas of high soil moisture.
 - 6. Near irrigation sprinkler heads.
 - 7. Each area where roof drainage system, including downspouts and scuppers, drains to soil.
 - 8. Along driplines of roof overhangs without gutters.

9. Where condensate lines from mechanical equipment drip or drain to soil.
10. At plumbing penetrations through ground-supported slabs.
11. Other sites and locations as determined by licensed Installer.

B. Inspect and service bait stations from time of their application until Substantial Completion unless extended by continuing service agreement, according to the EPA- Registered Label for product and manufacturer's written instructions for termite management system and bait products.

1. Service Frequency: Inspect bait stations not less than once every month.

3.6 INSTALLING POLYMER BARRIER FITTINGS

- A. Remove any pipe wrap material so that the polymer barrier fittings can be applied directly to the pipe or conduit. After installing the barrier, reapply pipe wrap material both below and above the blocker to protect the pipe from contact with concrete.
- B. Install polymer barrier fittings around each utility pipe and conduit penetrating concrete slab and foundation walls according to the EPA-Registered Label for the product and manufacturer's written instructions.

END OF SECTION 31 31 16

SECTION 32 91 00 - PLANTING PREPARATION

PART 1 - GENERAL

1.1 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.

1.2 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 specified soils.
 - 2. Supplying, placing, spreading and grading of specified soils.
 - 3. Providing all other sampling, testing, supplying, placing, spreading and grading of specified soils as required by this Section.

1.3 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
Characteristics of Soil Using Standard Effort (12,400 ft-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.
 - 4. Testing Methods for the Examination of Compost and Composting (TMECC): 02.02-
B Sample Sieving for Aggregate Size Classification

1.4 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:

1. Division 31 Section, EARTHWORK
2. Division 32 Section, TURF AND GRASSES
3. Division 32 Section, PLANTS

1.5 SUBMITTALS

- A. 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 EARTHWORK . Perform no work of placing and spreading loam until elevations have been confirmed and written report has been accepted by the Landscape Architect.
- B. 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 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.

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.
- C. 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.
- D. 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 Waypoint Analytical, Inc., 2790 Whitten Road, Memphis, TN, 38133 (901) 213-2400 or approved equal. Submit 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 (Compost)
 - 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.
 - d. Test for Examination of Compost and Composting shall be TMECC Test Method 02.02-B, Sample Sieving for Aggregate Size Classification.

1.6 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.

1.7 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

1.8 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

2.1 PLANTING SOIL

- A. Planting soils for all turf and planting shall be:
 - a. Manufactured from 3 components: 1) base topsoil, 2) coarse and medium sands, and 3) approved compost or
 - b. Topsoil meeting the requirements of paragraphs 2.05 PLANTING SOIL FOR LAWN AT GRADE and 2.06 PLANTING SOIL FOR TREES, SHRUBS AND GROUNDCOVERS, AND PERENNIALS of this specification.

2.2 BASE 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 base topsoil 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. Base 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. Base 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. Base 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 2.0 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. ($D80/D30 < 8$).

2.3 COMPOST

- A. Compost for amending planting soil: stable, humus-like material produced from the aerobic decomposition of organic residues. Compost products shall be the result of the biological degradation and transformation of Type I or III feed stocks under controlled conditions designed to promote aerobic decomposition, which shall have undergone thermophilic decomposition for a minimum of one year (12 months). Compost shall be free of debris such as plastics, metal, concrete or other debris and stones larger than 1/2", larger branches and roots and wood chips over 1/2" in length or diameter. Compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with a moisture

content that has no visible free water or dust when handling, with no unpleasant odor. Compost shall be stable with regard to oxygen consumption and carbon dioxide generation. Compost shall be mature with regard to its suitability for serving as a soil amendment or an erosion control BMP as defined below and meeting the following criteria as reported by laboratory tests performed within 60 days of intended use as planting soil amendment.

1. Compost material shall meet the following TMECC standards for Test Method 02.02-B, "Sample Sieving for Aggregate Size Classification.":

<u>Percentage Passing</u>	<u>Minimum</u>	<u>Maximum</u>
1"	99%	100%
5/8"	90%	100%
1/4"	40%	90%

2. The ratio of carbon to nitrogen shall be in the range of 12:1 to 25:1 as determined using TMECC 04.01, "Total Carbon" and TMECC 04.02D, "Total Kjeldhal Nitrogen." The Engineer may specify a C:N ratio up to 35:1 for projects where the plants are entirely native species.
3. Manufactured inert material (plastic, concrete, ceramics, metal, etc.) shall be less than 1.0 percent by weight as determined by TMECC 03.08-A, "Percent Dry Weight Basis."
4. Stability shall be assessed by the Solvita procedure. Protocols are specified by the Solvita manual (version 4.0). The compost must achieve a maturity index of 6 or more as measured by the Solvita scale. Stability tests shall be conducted by Woods End Research Laboratory, Mt. Vernon, Maine, Soil Control laboratory of California, or approved equal.
5. Organic Content: between 45 and 65 percent (dry weight). One hundred percent of the material shall pass a 3/8-inch (or smaller) screen. Organic content shall be determined by TMECC 05.07A, "Loss-On-Ignition Organic Matter Method."
6. pH: between 6.5 to 7.2 when tested in accordance with TMECC 04.11-A, "1:5 Slurry pH."
7. Salinity: Electrical conductivity of a one to five soil to water ratio extract shall not exceed 2.0 mmhos/cm (dS/m).
8. Soluble salt contents shall be less than 6.0 mmhos/cm tested in accordance with TMECC 04.10-A, "1:5 Slurry Method, Mass Basis."
9. Maturity shall be greater than 80 percent in accordance with TMECC 05.05-A, "Germination and Vigor."
10. Stability shall be 7 or below in accordance with TMECC 05.08-B, "Carbon Dioxide Evolution Rate."
11. The compost product must originate a minimum of 65 percent by volume from recycled plant waste. A maximum of 35 percent by volume of other approved organic waste, not including biosolids, may be substituted for recycled plant waste. The supplier shall provide written verification of feedstock sources.

- B. The compost supplier shall test all compost products within 90 calendar days prior to application. Samples shall be collected using the Seal of Testing Assurance (STA) sample collection protocol. The sample collection protocol can be obtained from the U.S. Composting Council, 4250 Veterans Memorial Highway, Suite 275, Holbrook, NY 11741 Phone: 631-737-4931, www.compostingcouncil.org. The sample shall be sent to an independent STA Program approved laboratory. The compost supplier shall pay for the test. A copy of the approved independent STA Program laboratory test report shall be submitted to the Engineer prior to initial application of the compost. Seven days prior to application, the Contractor shall submit a sample of each type of compost to be used on the project to the Engineer.
 - 1. Compost not conforming to the above requirements or taken from a source other than those tested and accepted shall be immediately removed from the project and replaced at no cost to the Owner.

- C. The Contractor shall submit the following information to the Engineer for approval:
 - 1. Written verification from the supplier and laboratory analyses that the materials comply with the processes, testing, and standards specified in these Specifications. An independent STA Program certified laboratory shall perform the analysis.
 - 2. A list of the feedstock by percentage present in the final compost product.
 - 3. A copy of the producer’s STA certification as issued by the U.S. Composting Council.

Acceptance shall be based upon a satisfactory Test Report from an independent STA Program certified laboratory and the sample(s) submitted to the Engineer.

2.4 SAND FOR PLANTING SOIL

- A. Sand: for mixing with base topsoil to meet specification requirements shall be uniformly graded coarse sand consisting of clean, inert, sharp grains of quartz or other durable rock and free from limestone, shale, slate, loam or clay, surface coatings, mica, other deleterious materials meeting the requirements of ASTM C-33 Fine Aggregate with the following gradation.

Percent Passing

U.S. Sieve Size Number	Minimum	Maximum
10	100	--
18	65	90
35	25	45
60	08	20
140	00	08
270	00	03
0.002 mm	00	0.3

- B. The pH of the sand shall be below 7.5.

- C. The ratio of particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.0 or less. (D70/D20 <3.0).
- D. Tests shall be combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

2.5 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. Planting Soil shall meet the following requirements.
- 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 80% passing (D80) to the particle size for 30% passing (D30) shall be 5.5 or less. (D80/D30 <5.5)
- D. Saturated hydraulic conductivity of the mix: not less than 2.0 inches per hour according to ASTM D5856-95 (2000) when compacted to a minimum of 88% Standard Proctor, ASTM 698.
- E. Organic content: between 3.0 and 6.0 percent by weight.
- F. pH Shall be between 6.0 and 7.2.

2.6 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. Planting Soil shall meet the following requirements.
- 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 80% passing (D80) to the particle size for 30% passing (D30) shall be 5.5 or less. (D80/D30 <5.5).

- D. Saturated hydraulic conductivity of the mix: not less than 2.0 inches per hour according to ASTM D5856-95 (2000) when compacted to a minimum of 88% Standard Proctor, ASTM 698.
- E. Organic content: between 4.0 and 8.0 percent by weight
- F. pH Shall be between 5.5 and 7.0.

2.7 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. 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 9100.

PART 3 - EXECUTION

3.1 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.
 - 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 (1) 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 except within the Critical Root Zone of existing trees to remain on site.
 - 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.

3.2 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.

3.4 FINE GRADING GENERAL

- A. Immediately prior to dumping and spreading planting soils in lawn areas, tree pits, planting beds, or detention pond areas, 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.
 - 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:

	<u>Minimum</u>	<u>Maximum</u>
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 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 4 inches of planting soils to the finished grade.

3.5 PERCOLATION TESTING

- 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 (1) one inch per hour, till the soil to a depth required to break the over compaction.
 4. 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.

3.6 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 32 91 00

SECTION 32 92 00 - TURF AND GRASSES

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all lawn sod, 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 of seed bed
 - 2. Sodding
 - 3. Maintenance and protection

1.3 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
 - 1. Division 32 91 00 Section, PLANTING PREPARATION
 - 2. Division 32 92 00 Section, PLANTS

1.4 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
 - 2. National Turfgrass Evaluation Program

1.5 SUBMITTALS

- A. Submit proof of landscape contractor's experience to the Owner's Representative in accordance with QUALITY ASSURANCE paragraph of this Section.

B. At least 30 days prior to intended use, the Contractor shall provide the following samples and submittals for approval. Do not order materials until Owner's Representative's acceptance has been obtained. Delivered materials shall closely match the approved samples. Acceptance of samples or submittals will not constitute final acceptance of the material. The Owner's Representative reserves the right to reject on or after delivery any material that does not meet these Specifications.

1. Seed: Submit a manufacturer's Certificate of Compliance to the Specifications with each shipment of each type of seed. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.
2. Sod: Submit Certification of conformance the sod meets the minimum conformance requirements for Tennessee Certified Turfgrass Sod.
3. Tackifier: Submit manufacturer's product literature.
4. Erosion Control Matting: Submit 2 copies of manufacturer's literature and one material sample.
5. All additives needed to amend a specific soil in order to meet these specifications.
6. Wood Cellulose Fiber Mulch: Submit copies of manufacturer's product literature and one material sample.
7. Certified Weed-Free Straw Mulch: Submit copies of certification and one material sample.
8. Flocculant: Submit copies of manufacturer's product literature and statement of compliance to EPA as well as applicable state and local regulations.
9. Proof of Experience: Proof of experience or certification installing conservation seed and use of compost manufactured topsoil shall be submitted for approval prior to installation.

1.6 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.

1.7 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

2.1 PLANTING SOIL

- A. Planting Soil shall be specified, provided, installed and paid for under the work of Division 32, Section, PLANTING PREPARATION, of this Specification.

2.2 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.

2.3 SEED

- A. Seed mixture shall be fresh, clean, new crop seed. Seed shall be of the previous year's crop and in no case shall the weed seed content exceed 0.25% by weight. The seed shall be furnished and delivered in the proportion specified below in new, clean, sealed and properly labeled containers. All seed shall comply with State and Federal seed laws. Seed that has become wet, moldy or otherwise damaged shall not be acceptable. Chewings fescue, hard fescue, tall fescue and ryegrass shall contain *Acromonium* endophytes. Seed containing endophyte must be kept cool and dry at all times; do not stockpile in the sun.
- B. In addition, Percent Pure Live Seed (PLS) shall be calculated for all seed lots using each seed lot's own unique purity and germination test results. Percent Pure Live Seed is defined by the following formula: $\text{Percent (\% Purity)} \times \text{Percent (\% Germination)} / 100 = \text{Percent (\% Pure Live Seed (PLS))}$. The minimum % PLS shall be 75% for each seed lot. A "PLS Pound" is defined as the bulk weight of seed required to equal one pound of 100% pure, germinable seed.
- C. Seed should be packaged according to size and method of seeding.

D. Seed Mixture Type 1 for General Lawns:

<u>Proportion Common Name</u>	<u>Germination By Weight</u>	<u>Purity Minimum</u>	<u>Minimum</u>
Creeping Red Fescue	30%	85%	95%
Kentucky Bluegrass	60%	85%	90%
Perennial Rye	10%	90%	90%

1. Bluegrass and ryegrass varieties shall be within the top 50 percent and 25 percent respectively, of varieties tested in National Turfgrass Evaluation Program, or currently recommended as low maintenance varieties by University of Tennessee.
2. Seeding rate for the General Lawn Seed Mix shall be 6 pounds per 1,000 square feet.

2.4 SOD

- A. Sod shall be nursery grown turf-type southern US drought tolerant fescue blend. Sod variety shall be primarily comprised of tall fescue with a mean score of 6.2 or greater as recorded in the 'Summary of Turfgrass Quality Ratings for Tall Fescue Cultivars' as found in the Appendix of the National Turfgrass Evaluation Program (NTEP) Final Reports. Sod mix shall include no less than 80% of specified tall fescue.
- 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.

2.5 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.

2.6 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.

2.7 EROSION CONTROL BLANKET

- A. Matting for erosion control on slopes steeper than three to one (3:1) and in detention pond areas and drainage swales shall be straw blanket composed of single net jute mesh netting of a uniform open plain weave. The yarn shall be of a loosely twisted construction having an average twist of not less than 1.6 turns per inch, and shall not vary in thickness by more than one half its normal diameter. The jute netting shall be stitched with biodegradable yarn shall be furnished in approximately 50 pound rolls meeting the following requirements:
 1. Width: 80 inches, plus or minus one inch.
 2. Weight: Straw Matrix shall be 0.5 lbs / square yard. Netting shall be approximately 9.3 lbs / 1,000 square feet.
 3. Staples shall be wood supplied by the manufacturer.

2.8 BONDED FIBER MATRIX FOR EROSION CONTROL

- A. Erosion control for covering hydromulch areas with slopes steeper than or equal to three to one (3:1) shall be a bonded fiber matrix. The bonded fiber matrix shall be a hydraulically applied product that upon drying shall adhere to the soil in the form of a continuous 100% coverage, biodegradable erosion control blanket. The bonded fiber matrix shall be comprised of long strand wood fibers held together by a bonding agent that, upon drying, becomes insoluble and non-dispersible.
- B. The bonded fiber matrix shall meet the following requirements. The binder shall not dissolve or disperse upon re-wetting. The matrix shall have no holes greater than 0.04 inch (1mm) in size. The matrix shall have no gaps between product and soil. The matrix shall have water-holding capacity of 1.2 gallons per pound of matrix (1000g/100g). The matrix shall have no germination or growth inhibiting factors and shall not form a water insensitive crust. The matrix shall be composed of materials that are 100% biodegradable and are beneficial to plant growth.

2.9 COMPOST MANUFACTURED TOPSOIL (CMT)

- A. Materials:
 - 1. The compost portion of CMT shall be derived from well-decomposed organic matter source produced by controlled aerobic (biological) decomposition that has been sanitized through the generation of heat and stabilized to the point that it is appropriate for this particular application. CMT shall be processed through proper thermophilic composting, for a process to further reduce pathogens' (PFRP).
 - 2. Flocculants shall be injected into the CMT at time of construction.
 - 3. CMT shall consist of a uniform mixture of compost and base soil to achieve the CMT final soil specifications.
 - 4. Compost used in the production of CMT shall be an organic substance produced by the biological and biochemical decomposition of source separated organic materials, which may include leaves and yard trimmings, food or industrial residuals, and/or municipal biosolids. The product shall not contain levels of substances that shall inhibit or otherwise be harmful to plant growth and shall be reasonably free (<1% by dry weight) of man-made foreign matter. Compost shall meet USEPA 40 CFR Part 503 standards for Class A, Exceptional Quality Compost, as well as all applicable state and local regulations for its intended use.
 - 5. Base soil, as necessary, shall consist of topsoil and/or other soil constituents (e.g. sand, silt, clay). Base soil shall be sand, sandy loam or loamy sand in texture (USDA soil classification). It shall be free of stones, lumps, plants, weeds, roots and other debris over 2 inches in any dimension. Base soil shall not contain levels of substances that shall inhibit or otherwise be harmful to plant growth.
 - 6. Polyacrylamide flocculant shall be included in CMT mixtures per manufacturer's recommendations.

7. Product Parameters:

Parameter	Compost	Base soil	CMT
pH	6.0-8.0	5.5-8.0	4.5 - 6.5
% Organic Matter	<40%	0-5%	6% - 20%
Particle Size	<1"	< 2", USDA	
		Class: Sand, Sandy Loam, Loamy Sand	< 2", USDA Class: Sand, Loam, Loamy Sand
Salts/conductivity	Must be Reported	<2mmhos/cm*	<4mmhos/cm
Carbon:Nitrogen Ratio	15-25:1	N/A	N/A
<p>¹ The soluble salt concentration of the compost and base soil may vary but must be reported.</p> <p>²After handling, placement and rainfall, final level should be less than 2mmhos/cm.</p>			

8. CMT shall be accomplished by means of rolling and tumbling by front end loaders and bulldozers or by processing in a mixing plant. The material shall be mixed sufficiently to produce a homogeneous soil, free of lumps and clods.

2.10 WOOD CELLULOSE FIBER MULCH

- A. Mulch to cover hydroseeded areas with slopes less than 3 to one shall be fiber processed from whole wood chips and clean recycled newsprint in a 1:1 proportion manufactured specifically for standard hydraulic mulching equipment. Fiber shall not be produced from recycled material such as sawdust, paper, or cardboard.
- B. Moisture content shall not exceed 10 percent, plus or minus 3 percent as defined by the pulp and paper industry standards. Fiber shall have a water holding capacity of not less than 900 grams water per 100 grams fiber.
- C. The mulch shall be of such character that the fiber will be dispersed into a uniform slurry when mixed with water. It shall be nontoxic to plant life or animal life.
- D. The mulch shall contain a non-petroleum based organic tackifier and a green dye to allow for easy visual metering during application but shall be non-injurious to plant growth.

2.11 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.
- C. The Contractor shall not apply herbicides, chemicals, or insecticides to the detention pond areas for seeding.

2.12 POLYACRYLAMIDE FLOCCULANT

- A. Polyacrylamide flocculant shall be APS 600 Series Silt Stop by Applied Polymer Systems, Inc. (www.siltstop.com) or approved equal.
- B. Polyacrylamide flocculant shall be used with meadow seed mix to reduce soil movement on slopes, increase soil permeability and water penetration, and reduce fertilizer loss during rain events.
- C. Polyacrylamide flocculant shall be applied by either a hydroseeder, water truck or other spraying device having a mechanical agitator, mixing apparatus, or hydraulic recirculation as part of compost manufactured topsoil (CMT). Pour emulsion into the spraying device with mixing apparatus operating. Allow emulsion to mix for one to two minutes before application. Polyacrylamide should be applied per manufacturer's recommendations at 1.5-2.0 gal./3000 gal. water/1 acre for gentle to moderate slopes and at 2.0-2.5 gal./3000 gal. water/1 acre for steep slopes (3:1 to 1:1).

2.13 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

3.1 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.

3.2 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.

3.3 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.

3.4 EROSION CONTROL BLANKET INSTALLATION

- A. Install blanket in the areas designated on the Contract Documents, on slopes three to one (3:1) or steeper, within surface drainage swales, at detention pond areas and around surface drains.
- B. Matting shall be installed perpendicular to slopes, and shall extend at least 3 feet beyond slope crest. Fibers shall be placed in contact with the soil for the entire length of the mat. Provide check slot at top of slope and anchor slot at bottom of slope where indicated.
- C. Roll out the matting perpendicular to the slope. Do not stretch the fabric. In drainage swales, center the fabric along the flow line. Install the matting in a check slot at the top and bottom of the slope of the area to be covered. Check slots shall be 6 inches deep and 6 inches wide. Fabric shall extend down one wall of the check slot and across the full width of the base. Overlap edges of matting rolls 4 inches minimum and overlap the ends 18 inches at a minimum.
- D. Install staples in check slots, edges, center and ends of rolls by driving specified steel staples 2 feet on center over the entire area to be covered, except at check slots and ends of rolls, where staples shall be placed 6 inches on center.
- E. Fill check slots with loam and tamp firmly.

- F. Following matting installation, roll the entire area with a smooth drum roller weighing between 50 and 75 pounds per linear foot of roller. The finished installation of matting shall be firmly in contact with the soil and provide a smooth, finished appearance free from lumps or depressions.

3.5 SEEDING

- A. Contractor shall obtain Owner's Representative's written approval of bed preparation before commencement of seeding operations.
- B. The seasons for seeding shall be September 1 to November 31. The actual planting of seed 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.
- C. The use of a pneumatic blower truck at 3" of compost manufactured topsoil (CMT) to broadcast seed is required. The use of hydraulic or specialized grass and forb drill seeders will not be accepted.
- D. Application Seeding Rates:
 - 1. Winter Oats shall be seeded at an application rate of thirty pounds per acre (30 LBS/AC).
 - 2. Seed Lawn Seed Mix at an application rate of sixty pounds per acre (60 LBS/AC) with compost manufactured topsoil (CMT).
- E. CMT shall be placed by the contractor using a pneumatic blower to control and reduce soil erosion. CMT shall be spread to the uniform final depth in the approved project design. CMT shall be spread in a manner as to establish a loose, friable seed bed.

3.6 SODDING

- A. The season for sodding shall be in spring from March 1 through May 21 and in fall from Sept. 21 to Dec. 1. 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.

3.7 MAINTENANCE OF SEEDED AREAS

- A. Maintenance shall begin immediately after any area is seeded and mulched and shall continue until Final Acceptance of the project.
- B. Maintenance shall include reseeding, watering, and selective weeding.
- C. Weeding:
 - 1. Spot application of 50% strength isopropylamine salt of glyphosate to emerged weed species.
 - 2. Do not spray detention pond area for weeding purposes.
 - 3. Hand pull emerged weed species twice monthly from detention pond areas.
- D. 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.
- E. Watering, during the spring planting window specified herein, shall be performed during the first 6 to 8 weeks after seeding. Water 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. Do not water during the fall planting window specified herein.
 - 1. The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable seeded area. Maintain moist soil to a depth of at least 2 inches.
 - 2. Beyond the specified 6 to 8 week watering after seeding, water in the absence of adequate rainfall as determined by the Owner's Representative.
 - 3. Water only in the mornings before 8:00 am. Furnish sufficient watering equipment to apply water to the required soil depths each 24-hour period.

- F. After the seeded areas have germinated, reseed all areas and parts of areas that fail to show a uniform stand. Reseed such areas and parts of areas repeatedly until all areas are covered with a satisfactory growth of grass. Reseeding together with necessary grading, and trimming shall be done at the Contractor's expense.

3.8 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, weeding, 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 plants 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 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 not mow seeded areas.
 - 2. 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.
 - 3. 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.
 - 4. 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.

3.9 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.

3.10 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/perennials 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/perennials established shall be permanent 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.

3.11 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 32 92 00

SECTION 32 93 00 - PLANTS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. The work of this Section includes all labor, equipment, and materials, necessary to perform the following:
 - 1. Planting trees, shrubs, vines, ground cover, bulbs, plugs and perennials.
 - 2. Providing and placing backfill mix.
 - 3. Anchoring trees.
 - 4. Edging plant beds
 - 5. Planting maintenance.
 - 6. One-year guarantee period for all plants

1.3 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 91 00 PLANTING PREPARATION
 - 2. Section 32 92 00 TURF AND GRASSES

1.4 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

1.5 SUBMITTALS

- A. 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.
- B. Material Sampling and Testing:
 - 1. Planting Mulch: Submit a one cubic foot sample.
 - 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.
- C. Submit proof of landscape contractor's experience to the Landscape Architect.

1.6 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 prior to beginning this work.

1.7 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 shall be performed by an arborist certified by the International Society of Arboriculture.

PART 2 - PRODUCTS

2.1 PLANTING SOIL

- A. Planting Soil for planting shall be specified, provided, installed and paid for under the work of the Section 32 9100 PLANTING PREPARATION, of this Specification.

2.2 SOIL ADDITIVES

- A. Soil additives shall be specified, provided, installed and paid for under Section 32 9100 PLANTING PREPARATION, of this Specification.

2.3 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 be specimen quality, defined as being exceptionally heavy, symmetrical, and so managed and trained in the nursery so that their appearance is superior in silhouette, form and mass in the opinion of the Landscape Architect, who shall be the sole judge of specimen quality.
 - 2. Trees shall be free of disease, insects, insect eggs or larvae.
 - 3. Trees shall be free from physical damage or other conditions that would prevent vigorous growth.
 - 4. 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.
 - 5. Trees with multiple leaders, unless so specified on the Planting Plan, shall be rejected. If specified on the Planting Plan, trees with multiple leaders shall conform to all standards noted in this Section for single leader trees.
 - 6. The bark of all trees shall be vigorous and healthy.
 - 7. Pruning scars shall be clean cut and shall leave no protrusion beyond the branch collar.
 - 8. All trees shall have healthy, vigorous leaves or needles of normal size, color, shape, and texture.
 - 9. Deciduous trees shall have fall color typical for their species and variety.
 - 10. The height, spread, and caliper of deciduous shade trees shown on the PLANT SCHEDULE shall be minimum requirements.
 - 11. No deciduous tree shall be pruned after selection in the nursery unless pruning is mandated by the Landscape Architect.
- E. 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 SCHEDULE. When indicated on the PLANT SCHEDULE, 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.

H. All perennials shall meet the following standards:

1. Perennials shall be listed in the PLANT SCHEDULE.
2. Perennials shall be healthy and well cared for, with no evidence of insects or diseases present. Insect-ridden or diseased plants shall be rejected. Plants shall have a richly colored foliage and dense, compact growth. Perennials shall have multi-stemmed bases and shall be two year potted stock minimum, one year in cutting bench and one year in pots.

2.4 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 and 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.

2.5 INOCULANTS

- A. Inoculants shall be manufactured by Horticultural Alliance, 1550 66th Avenue Drive East, Sarasota, FL 34243, (800) 628-6373; or approved equal.

2.6 MATERIALS FOR PLANTING SOIL AMENDMENT

- A. Hardwood Bark: Horticultural-grade milled hardwood bark, with 80 percent of the material by volume sized between 0.1 and 15.0 mm.
 - 1. Hardwood bark shall be aged sufficiently to break down all woody material. Hardwood 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.
 - 1. Compost for planting shall be specified, provided, installed and paid for under the work of the section 32 9100 PLANTING PREPARATION, of this Specification.
- 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)	2-10

- 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.

2.7 PLANTING SOIL MIX

- A. Planting soil shall be as specified as in Section 32 91 00 PLANTING PREPARATION.
- B. Planting soil mix shall be thoroughly mixed, screened, and shredded.
- C. Protect the planting soil mix from erosion prior to installation.

2.8 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.

2.9 MULCH

- A. Bark Mulch: Mulch shall be high quality, premium bark mulch of hardwood deciduous bark. Mulch shall have been aged for a minimum of six months and not longer than two years. Bark mulch shall be triple shredded to a uniform size; free of dirt, debris and foreign matter; with pieces no thicker than 1/4 inch. Mulch must be free of stringy material or chunks over 3 inches in size and shall not contain an excess of fine particles.

- B. Stone Mulch: Stone Mulch shall be water washed river slicks, grey in color, with rounded edges, free from organic materials, surface coatings, or other deleterious materials. Stone mulch shall not be limestone. Stone shall be between 4"-8" in size.
- C. Geotextile fabric for weed control shall be of nonwoven, needle-punched construction; composed of polyethylene, polypropylene, or polyester materials.
 - 1. Geotextile fabric shall be a nonwoven polypropylene fabric with a porosity of not greater than 5 percent open and have the following properties:
 - a. Grab tensile strength: 370 lbs.
 - b. Grab tensile elongation:50%
 - c. Mullen burst strength: 380 psi
 - d. Puncture strength: 130 lbs.
 - e. Apparent opening size: US sieve 80
 - f. Water flow rate: 95 gpm/SF
 - 2. Geotextile fabric shall be greater than 90 percent opaque and shall be guaranteed against ultraviolet light for no less than 5 years.
 - 3. Geotextile shall be delivered in 12 foot wide rolls min.
 - 4. Product shall be DeWitt Pro 5 by the DeWitt Company, Sikeston, MO; TenCate Mirafi 160N by the TenCate Company, Pendergrass, GA; or approved equal.

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

3.1 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, furnishing the plants, installing plant bed edging, 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, shrubs, groundcover, perennials and vines between November 15 through February 15 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.

D. 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 (10) 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.
 - d. Prior to planting check for evidence of unexpected water seepage or retention in planting pit before planting.
4. Groundcover, Bulb, and Perennial Beds:
 - a. Planting beds for groundcover, bulbs and perennials shall be dug to a continuous depth of one foot below final grade, or as shown on the Contract Documents.
 - b. Bulbs shall be planted at depths as recommended by bulb supplier, as shown on the Contract Documents, or both.
5. Geotextile:
 - a. Install geotextile over compacted subgrade and/or aggregate infiltration beds as shown on drawings.

- b. Install the geotextile with a minimum joint overlap of 18 inches between sections of material.
- c. Ensure geotextile is laid flat with no folds or creases.
6. 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.
7. 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.
8. Trees and shrubs shall be placed in center of planting pit with plant plumb, with root flares exposed and at adjacent grade.
9. 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 rootball.
10. Examine root balls and remove stem girdling roots and kinked roots.
11. Cut all wire baskets from the root ball and remove the entire basket.

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 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. When pit is half full, water thoroughly. Continue backfilling with planting soil.
5. A saucer shall be formed around each stand-alone tree and shrub at a depth of 3 inches.
6. 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.
7. 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.
8. 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.
9. 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.
 10. 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.
 11. 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 the 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 in all locations in which plant beds abut lawn areas and as shown in the drawings. Fully bed the steel edging as shown on the Detailed Drawings, with 1' min remaining above finish grade of lawn. 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. Layout of edging is subject to review and approval by the Landscape Architect.
- 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.

3.2 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.

3.3 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.

3.4 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 32 93 00

SECTION 33 46 00 - SUBDRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes subdrainage systems for the following:
 1. Foundations.

1.2 DEFINITIONS

- A. PE: Polyethylene plastic.
- B. PVC: Polyvinyl chloride plastic.
- C. Subdrainage: Drainage system that collects and removes subsurface or seepage water.

1.3 SUBMITTALS

- A. Product Data: For the following:
 1. Perforated-wall pipe and fittings.
 2. Solid-wall pipe and fittings.
 3. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 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.

2.2 PIPING MATERIALS

- A. Refer to the "Piping Applications" Article in Part 3 for applications of pipe, tube, fitting, and joining materials.

2.3 PERFORATED-WALL PIPES AND FITTINGS

- A. Perforated PE Pipe and Fittings:
 1. NPS 6 and Smaller: ASTM F 405 or AASHTO M 252, Type CP; corrugated, for coupled joints.
 2. NPS 8 and Larger: ASTM F 667; AASHTO M 252, Type CP; or AASHTO M 294, Type CP; corrugated; for coupled joints.
 3. Couplings: Manufacturer's standard, band type.

2.4 SOLID-WALL PIPES AND FITTINGS

- A. PVC Sewer Pipe and Fittings: ASTM D 3034, SDR 35, bell-and-spigot ends, for gasketed joints.
 - 1. Gaskets: ASTM F 477, elastomeric seal.

2.5 SPECIAL 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.
 - 1. Sleeve Materials:
 - a. For Concrete Pipes: ASTM C 443, rubber.
 - b. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - c. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - d. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
 - 2. Unshielded Flexible Couplings: Elastomeric sleeve with corrosion-resistant metal tension band and tightening mechanism on each end.
 - 3. Shielded Flexible Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant metal tension band and tightening mechanism on each end.

2.6 CLEANOUTS

- A. PVC Cleanouts: ASTM D 3034, PVC cleanout threaded plug and threaded pipe hub.

2.7 SOIL MATERIALS

- A. Backfill, drainage course, impervious fill, and satisfactory soil materials are specified in Section 31 20 00 - Earthwork.

2.8 GEOTEXTILE FILTER FABRICS

- A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.
 - 1. Structure Type: Nonwoven, needle-punched continuous filament.
 - 2. Style(s): Flat and sock.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Section 02300 - Earthwork.

3.3 PIPING APPLICATIONS

- A. Underground Subdrainage Piping:
 - 1. Perforated PE pipe and fittings, couplings, and coupled joints.
 - 2. Perforated PVC sewer pipe and fittings for loose, bell-and-spigot joints.
- B. Header Piping:
 - 1. PVC sewer pipe and fittings, couplings, and coupled joints.

3.4 CLEANOUT APPLICATIONS

- A. In Underground Subdrainage Piping:
 - 1. At Grade in Earth: PVC cleanouts.
 - 2. At Grade in Paved Areas: Cast-iron cleanouts.

3.5 FOUNDATION DRAINAGE INSTALLATION

- A. Place impervious fill material on subgrade adjacent to bottom of footing after concrete footing forms have been removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches deep and 12 inches wide.
- B. Place impervious fill on subgrade adjacent to bottom of footing and compact to dimensions indicated, but not less than 6 inches deep and 12 inches wide after concrete footing forms have been removed.
- C. Lay flat-style geotextile filter fabric in trench and overlap trench sides.
- D. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.
- E. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with tape.
- F. Install drainage piping as indicated in Part 3 "Piping Installation" Article for foundation subdrainage.
- G. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.
- H. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.
- I. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.

- J. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.

3.6 RETAINING-WALL DRAINAGE INSTALLATION

- A. Lay flat-style geotextile filter fabric in trench and overlap trench sides.
- B. Place supporting layer of drainage course over compacted subgrade to compacted depth of not less than 4 inches.
- C. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with tape.
- D. Install drainage piping as indicated in Part 3 "Piping Installation" Article for retaining-wall subdrainage.
- E. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.
- F. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.
- G. Place drainage course in layers not exceeding 3 inches in loose depth; compact each layer placed and wrap top of drainage course with flat-style geotextile filter fabric.
- H. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.
- I. Fill to Grade: Place satisfactory soil fill material over compacted drainage course . Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish grade.

3.7 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
 - 1. Foundation Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 30 inches unless otherwise indicated.

2. Retaining-Wall Subdrainage: When water discharges at end of wall into stormwater piping system, install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 30 inches, unless otherwise indicated. However, when water discharges through wall weep holes, pipe may be installed with a minimum slope of zero percent.
 3. Lay perforated pipe with perforations down.
 4. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.
 - C. Install PE piping according to ASTM D 2321.
 - D. Install PVC piping according to ASTM D 2321.
 - E. Connect all subdrainage piping to drain to storm sewer system.

3.8 PIPE JOINT CONSTRUCTION

- A. Join PE pipe, tubing, and fittings with couplings for soil-tight joints according to AASHTO's "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4, "Joint Properties."
- B. Join perforated, PE pipe and fittings with couplings for soil-tight joints according to AASHTO's "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4, "Joint Properties"; or according to ASTM D 2321.
- C. Join PVC pipe and fittings according to ASTM D 3034 with elastomeric seal gaskets according to ASTM D 2321.
- D. Join perforated PVC pipe and fittings according to ASTM D 2729, with loose bell-and- spigot joints.
- E. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.9 FIELD QUALITY CONTROL










- A. Testing: After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

3.10 CLEANING

- A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 33 46 00

Five Points Infill Housing Construction Phase 3
Solicitation Document A General Information

Sign Your Name to the Right of the Arrow 	
Your signature indicates that you have read and agree to "KCDC's General Instructions to Suppliers" on www.kcdc.org .	
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 	

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 bid.

Acknowledge addenda have been issued by checking below as appropriate:

None <input type="checkbox"/>	Addendum 1 <input type="checkbox"/>	Addendum 2 <input type="checkbox"/>	Addendum 3 <input type="checkbox"/>	Addendum 4 <input type="checkbox"/>	Addendum 5 <input type="checkbox"/>
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Statistical Information

This business is owned & operated by persons at least 51% of the following ethnic background:

Asian/Pacific <input type="checkbox"/>	Black <input type="checkbox"/>	Hasidic Jew <input type="checkbox"/>	Hispanic <input type="checkbox"/>	Native <input type="checkbox"/> Americans	White <input type="checkbox"/>
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As defined on KCDC's webpage (see the "General Instructions to Suppliers"), this business qualifies as:

Section 3 <input type="checkbox"/>	Small Business <input type="checkbox"/>	Woman Owned <input type="checkbox"/>
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Prompt Payment Discount

A discount of ____% is offered if payment is made within 30 days

Insurance Requirements

I have reviewed the insurance requirements in this solicitation and will provide KCDC with a Certificate of Insurance adhering to these requirements within the stated number of days. Yes No

Mastercard Acceptance

Mastercard is accepted for payment without additional fees. Yes No

Mastercard is accepted for payment with a fee of _____. Yes No

Costs

Total Project Cost in Numerals	\$
Total Project Cost in Words	\$

Note: If the information entered above does not match, the cost written in numerals will be the official bid.

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 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 contendere 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.

9. Iran Divestment Act:

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, owners, 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, owners, employees, or parties in interest, including this affiant.

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

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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)(1) 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)(1) 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)

(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 company 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.

Five Points Infill Housing Construction Phase 3
Solicitation Document C HUD Form 5369A-continued

(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)

- | | |
|---|---|
| <input type="checkbox"/> Black Americans | <input type="checkbox"/> Asian Pacific Americans |
| <input type="checkbox"/> Hispanic Americans | <input type="checkbox"/> Asian Indian Americans |
| <input type="checkbox"/> Native Americans | <input type="checkbox"/> Hasidic Jewish Americans |

9. Certification of Eligibility Under the Davis-Bacon Act

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) _____

**Five Points Infill Housing Construction Phase 3
Solicitation Document D Good Faith Compliance Affidavit**

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 can be useful to the supplier 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 Form of Commitment/Statement of Effort timely will be cause to reject the bid.**)

Company Name	Person	Product/Service	MOB	WOB

Section Two MOB/WOB's were not contacted because sub-suppliers suppliers 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	

**Five Points Infill Housing Construction Phase 3
Solicitation Document E Form of Commitment: Minority Owned Business/Woman Owned Business**

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 firm has or will enter into a formal agreement with the MOB/WOB enterprise for work listed in this schedule.

Name of Firm	M O B	W O B	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: _____



If a bid reaches or exceeds **\$25,000**, state law requires certain bidder license information be on the front of your envelope. As a condition of holding your license, you are to know these requirements.


KCDC provides the following page, the envelope cover sheet, as a courtesy. **You** are ultimately responsible for providing the correct information that is required to be on the front of your envelope. Failure to supply such information as is required by the State of Tennessee will invalidate your bid.

For more information go to: <http://tn.gov/regboards/suppliers/FAQ.shtml>

Attach the following page, when properly completed, to the front of your bid envelope.

Do not put it inside the envelope.

**Five Points Infill Housing Construction Phase 3
Solicitation Document F Envelope Coversheet**

Bid Due Date/Time	12-05-17 at 2:00 p.m.		
Bidder's/Firm's Name			
State of Tennessee Supplier's License Holder Name			
State of Tennessee Supplier's License Number			
Pertinent State of Tennessee Supplier's License Classification			
State of Tennessee Supplier's 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 Supplier's License		State of Tennessee Supplier License Number	
State of Tennessee Supplier License Classification(s)		Expiration Date of State Supplier's	
HVAC Subcontractor Name on the State of Tennessee's Supplier's License		State of Tennessee Supplier License Number	
State of Tennessee Supplier License Classification(s)		Expiration Date of State Supplier's	
Masonry Subcontractor Name on the State of Tennessee's Supplier's License		State of Tennessee Supplier License Number	
State of Tennessee Supplier License Classification(s)		Expiration Date of State Supplier's	
Plumbing Subcontractor Name on the State of Tennessee's Supplier's License		State of Tennessee Supplier License Number	
State of Tennessee Supplier License Classification(s)		Expiration Date of State Supplier's License	

Advisement: KCDC will not consider notes changing the bid written on the bid envelope. Such notes must be inside the envelope.