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www.kcdc.org

Request for Proposals

Solicitation Title	Set Up of Modular Housing Units
Solicitation Number	C19009
Due Date/Time	By 2:00 p.m. on March 15, 2019
Deliver Responses to	Knoxville's Community Development Corporation Procurement Division 901 N. Broadway Knoxville, TN 37917 The Procurement Building is behind the main office building.
Electronic Copies	Electronic copies are available on KCDC's webpage or by email at **purchasinginfo@kcdc.org**.
Responses may be emailed to KCDC	☐ Yes ☒ No
Printed responses required	☒ Yes ☐ No
Solicitation Meeting	☒ Yes ☐ No
Solicitation Meeting is Mandatory	☐ Yes ☒ No
Solicitation Meeting Date	March 6, 2019
Solicitation Meeting Time	10:00 a.m.
Solicitation Meeting Location	In KCDC's Board Room at 901 N Broadway in Knoxville.
Questions About This Solicitation	KCDC will not accept questions via telephone. Submit questions to **purchasinginfo@kcdc.org by** 10:00 a.m. on March 11, 2019**.**
Award Results	KCDC posts a summary of the responses received and the award decision to **http://www.kcdc.org/procurement/**
Open Records/Public Access to Documents	All document provided to KCDC are subject to the Tennessee Open Meetings Act (TCA 8-44-101) and open records requirements.
Plans/Blueprints	Blueprints/plans are available from ACS Printing, 201 Center Park Drive Suite 1120, Knoxville, TN 37922. Call 675-3020 or **craig@acsprint.com**

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. Several of the properties include Low Income Housing Tax Credits units and KCDC is both the General Partner and the management company for those sites. Those properties include Eastport Development, LP; Five Points 1, LP; Five Points 2, LP; Five Points 3, LP; Lonsdale, LP; North Ridge Crossing, LP; and Vista at Summit Hill, LP. KCDC also oversees approximately 3,958 Section 8 Vouchers, 82 Moderate Rehabilitation units and 20 Redevelopment areas.

b. KCDC, on the behalf of Knoxville's Housing Development Corporation (KHDC), is seeking formal sealed proposals for the set-up of affordable modular duplex and single family housing on a strip of vacant lots located on Clifton Road in the Knoxville area.

c. This solicitation is generally for the foundations, sidewalks and curbing, and set-up and finish work of 53 modular units (including connecting utilities and finish grading and seeding). Rough Grading, stormwater, retaining walls (2) and driveways (except top coat and striping) will be handled by the grading contractor.

d. KCDC expects that the existing power lines will remain.

e. KCDC's site engineer is handling various components of the project including:
- Site planning
- Coordination with MPC
- Elevation certificates and surveys
- Stormwater plan
- Land plan

2. **Bonds**

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

a. A proposal bond from each supplier equivalent to five percent (5%) of the proposal price. Such proposal bond must accompany the proposal. Proposal 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 KCDC' staff or Board members, other than the KCDC's Procurement Division, about matters pertaining to this solicitation, from its issuance 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 KHDC's Board approval.

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

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

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

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

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

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

h. Prohibit employees from being on KCDC' premises unless they are working on the project.

i. Prohibit acquaintances, family members, assistants, or any person not working on owner's behalf from accompany employees on KCDC' sites.

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

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

a. KCDC will review all proposals and reserves the right to request necessary modifications, waive minor technicalities, reject all proposals, reject any proposal that does not meet mandatory requirement(s) or cancel this RFP, according to KCDC's best interests.

b. KCDC's Evaluation Team may elect to interview one or more suppliers before making an award. Interviews may include an in-person examination of the proposed product. KCDC shall not reimburse the supplier for the costs associated with the interview process.

Factors	Maximum Points
Business Description/Summary of Skills and Qualifications/Capacity	25
References	5
Cost	70
Total	100

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

13. **Insurance**
See Appendix A. These insurances and levels are required and not optional. If you or your insurance agent have concerns or believe that some coverages are not necessary, email **purchasinginfo@kcdc.org** detailing any requested changes before this solicitation's due date.

14. **Invoicing**

a. KCDC will process pay applications once per month.

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

c. KCDC normally pays by electronic transfer (ACH) only. KCDC does not issue checks. Suppliers will need to set up their access to KCDC's Supplier Portal to track actual payments made.

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

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

15. **Licensure**

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

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

c. The Executive Director of the State Contractor Licensing Board says one of these licenses is required:
- BC (Commercial)
- BC-B (Commercial)
- BC-5 (Foundations)
- BC-19 (Concrete)
- HC (Heavy Construction)
- HC-3 (Foundation, Pile Driving, Drilling and Stabilization)

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

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

16. **Liquidated Damages**
Liquidated damages of $300.00 per calendar day for each day beyond the scheduled completion date apply and are included in the award. This applies to both the infrastructure and the construction work. KCDC will consider explanatory information if it provides a valid reason for delays in schedule.

17. **Materials and Workmanship**
All materials and equipment furnished shall be new and of high quality. Work shall be accurate, skilled and subject to approval of KCDC. Suppliers shall furnish material samples for approval if requested.

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

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

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

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

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

21. **Safety and OSHA Guideline Compliance**

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

b. Staff and the public safety are 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 comply with all other OSHA and TOSHA safety standards that apply.

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

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

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

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

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

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

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

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

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

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

g. A Section 3 business is one that:

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

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

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

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

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

   2. A Section 3 Business plan for this work.

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

24. **Site Examination**

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

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

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

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

25. **Smoking Policy**

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

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

HUD definitions include:

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

✓ "Electronic Smoking Device" means any product containing or delivering nicotine or any other substance intended for human consumption that can be used by a person in any manner for the purpose of inhaling vapor or aerosol from the product.

The term includes any such device, whether manufactured, distributed, marketed or sold as an e-cigarette, e-cigar, e-pipe, e-hookah or vape pen or under any other product name or descriptor.

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

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

26. **Storm Water and Street Ordinances**
The City of Knoxville's Storm Water and Street Ordinances apply to this solicitation. The successful supplier will comply with 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 at http://www.cityofknoxville.org/engineering/stormwater/npdes.asp.

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

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

27. **Subcontractors**
Subcontractors must:

a. Be approved by KCDC prior to beginning work.

b. Carry the insurance coverages as outlined herein.

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

d. Not be on HUD's Debarment List.

e. Not be changed without owner's permission.

28. **Time for Completion**
Supplier will complete the entire project within 100 calendar days from the date of the Notice To Proceed. Upon award, the successful supplier will work with KCDC to develop a schedule that is satisfactory.

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

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

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

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

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

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

f. General Decision Information for the work:

General Decision Number	TN190022
Date	01-05-19
State	Tennessee
Construction Types	Residential
Counties	Anderson and Knox Counties in Tennessee
Residential	Residential Construction Projects (consisting of single-family homes and apartments up to and including 4 stories.
Modification Number	0

Classifications and rates:

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.		

7. Suppliers may not "use a classification" because there is not one listed that exactly identifies the work performed. Unlisted Classifications needed for work not included within the scope of the classifications listed above may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)). To request an additional classification:

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

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

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

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

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

    - HUD will notify KCDC of the decision.

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

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

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

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

30. **<u>Weather</u>**

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

a. 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 KCDC.

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

d. Documentation and Submittals

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

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

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

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

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

e. Approval by KCDC

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

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

31. **Submittal Instructions**
Submit your information in the order indicated below:

Document Number	Title	Form Provided by
Solicitation Document A	General Response Section	KCDC
Solicitation Document B	Affidavits	KCDC
Solicitation Document C	HUD Form 5369A	KCDC
Solicitation Document D	Business Description and Summary of Skills and Qualifications	Supplier
Solicitation Document E	Supplier's Previous Experience/References	Supplier
Solicitation Document F	Supplier's Action Plan and Timeline	Supplier
Solicitation Document G	Supplier's Cost Proposal	Supplier

a. Place your company's name on each page and number all pages consecutively.

b. The use of tables in presenting information facilitates the evaluation team's review.

c. Do not use phrases such as "See the attached" or "Will be provided upon award."

d. Bind proposals simply since KCDC ultimately scans documents into electronic format. Acceptable binding methods include paper clips, staples and three ring binders.

Scope of Work (Provided by Cannon & Cannon)

1. Scope of Work (Summary)

The scope of work for this contract includes all work associated with site utilities (water, sewer, electric), foundation construction, installation of pre-manufactured housing units, sidewalk and parking lot construction (extruded curb, surface coat, striping and signage), fine grading, erosion control maintenance and removal, and final site stabilization. Previous contract included mass grading/site preparation (to subgrade conditions), storm sewer installation, erosion control, retaining walls, and asphalt binder course and stone subbase. These items are not to be included with this scope of work. Reference the attached Detailed Scope of Work for additional information on specific items related to the pre-manufactured units.

2. **Planned Construction Sequence**

The following construction sequence has been included in order to provide a progression of completed units and site stabilization.

a. <u>Stage 1 (Lots 20-28)</u>

1. Install water and sewer services
2. Construct foundations
3. Prepare foundation for setting pre-manufactured housing units
4. Take delivery and set pre-manufactured housing units
5. Complete construction of pre-manufactured housing units including applicable utilities
6. Construct sidewalks and install extruded curbs
7. Install asphalt surface course
8. Install striping and ADA parking signage
9. Fine grade lots and spread topsoil in preparation for final stabilization
10. Install permanent seed/mulch
11. Punch list/closeout for Stage 1

b. <u>Stage 2 (Lots 11-19 / Work can be performed concurrently with Stage 1)</u>

12. Install water and sewer services
13. Construct foundations
14. Prepare foundation for setting pre-manufactured housing units
15. Take delivery and set pre-manufactured housing units
16. Complete construction of pre-manufactured housing units including applicable utilities
17. Construct sidewalks and install extruded curbs
18. Install asphalt surface course
19. Install striping and ADA parking signage
20. Fine grade lots and spread topsoil in preparation for final stabilization
21. Install permanent seed/mulch
22. Punch list/closeout for Stage 2

c. Stage 3 (Lots 1-10 / Work can be performed concurrently with Stage 1 and 2)

23. Install water and sewer services
24. Construct foundations
25. Prepare foundation for setting pre-manufactured housing units
26. Take delivery and set pre-manufactured housing units
27. Complete construction of pre-manufactured housing units including applicable utilities
28. Construct sidewalks and install extruded curbs
29. Install asphalt surface course
30. Install striping and ADA parking signage
31. Fine grade lots and spread topsoil in preparation for final stabilization
32. Install permanent seed/mulch
33. Punch list/closeout for Stage 3

END OF SECTION

FACILITY SANITARY SEWERS
SECTION 221313

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Standard Specifications for the Knoxville Utilities Board and City of Knoxville Building Code.

1.2 SUMMARY

A. This Section includes gravity-flow, non-pressure sanitary sewerage outside the building, with the following components:
   1. Pipe and fittings.
   2. Cleanouts.

1.3 SUBMITTALS

A. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

B. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

C. Field quality-control reports.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Handle manholes according to manufacturer's written rigging instructions.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

   1. Notify Architect and Utility Owner no fewer than three days in advance of proposed interruption of service.
   2. Do not proceed with interruption of service without Architect's and Utility Owner's written permission.

PART 2 - PRODUCTS

2.1 All materials necessary to complete the installation of sanitary sewer for the project shall comply with the provisions stated in the Standard Specifications for the Knoxville Utilities Board and the applicable building codes for the project.

PART 3 - EXECUTION

3.1 SANITARY SEWER CONSTRUCTION

A. Construction necessary to complete the installation of sanitary sewer for the project shall comply with the provisions stated in the Standard Specifications for the Knoxville Utilities Board and the applicable building code.

3.2 FIELD QUALITY CONTROL

A. Inspection and testing necessary to complete the installation of sanitary sewer for the project shall comply with the provisions stated in the Standard Specifications for the Knoxville Utilities Board.

END OF SECTION

SECTION 312000

EARTH MOVING

PART 16 - GENERAL

16.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Report of Limited Geotechnical Exploration, Clifton Road Development, dated December 17, 2018 by GEOServices, LLC.

16.2 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Excavating and backfilling for buildings and structures.
4. Subbase course for concrete walks and pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements may include the following sections:

1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
2. Section 312319 "Dewatering" for lowering and disposing of ground water during construction.

16.3 UNIT PRICES

A. Work of this Section is affected by unit prices for earth moving specified in Section 012213 "Unit Prices."

B. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.

1. 24 inches outside of concrete forms other than at footings.
2. 12 inches outside of concrete forms at footings.
3. 6 inches outside of minimum required dimensions of concrete cast against grade.
4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
5. 6 inches beneath bottom of concrete slabs-on-grade.
6. 6 inches beneath pipe in trenches, and 12 inches wider than pipe.

16.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Designer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-maximum-width, short-tip-radius rock bucket; rated at not less than 138-hpflywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 1 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

16.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct pre-excavation conference at Project site. Retain subparagraph below if additional requirements are necessary; include information about conference.

1. Review methods and procedures related to earthmoving, including, but not limited to, the following:

    a. Personnel and equipment needed to make progress and avoid delays.
    b. Coordination of Work with utility locator service.
    c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
    d. Extent of trenching by hand or with air spade.
    e. Field quality control.
    f. Erosion Control installation, maintenance and inspection.

16.6 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Geofoam.
4. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: 12 by 12 inches.
2. Warning Tape: 12 inches long; of each color.

16.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

16.8 QUALITY ASSURANCE

A. Blasting: Blasting will NOT be allowed for this project.

B. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

16.9 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify both “TN One Call” and a local utility locator service for utility clearance within the area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until the Notice of Coverage is issued by the City of Knoxville and temporary site fencing and erosion- and sedimentation-control measures specified within the plans and in Section 015000 "Temporary Facilities and Controls" and Section 311000 "Site Clearing" are in place.

D. 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.

E. Do not direct vehicle or equipment exhaust towards protection zones.

F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 17 - PRODUCTS

17.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups CL, CH, GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Unit Weight: Greater than 90 pcf
2. Plasticity Index: Less than 30

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, ML, OL, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within a range of -3 to +2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inchsieve and zero to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33/C 33M; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

17.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:

    a. Grab Tensile Strength: 157 lbf; ASTM D 4632.
    b. Sewn Seam Strength: 142 lbf; ASTM D 4632.
    c. Tear Strength: 56 lbf; ASTM D 4533.
    d. Puncture Strength: 56 lbf; ASTM D 4833.

3. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
4. Permittivity: 0.5 per second, minimum; ASTM D 4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:

    a. Grab Tensile Strength: 247 lbf; ASTM D 4632.
    b. Sewn Seam Strength: 222 lbf; ASTM D 4632.
    c. Tear Strength: 90 lbf; ASTM D 4533.
    d. Puncture Strength: 90 lbf; ASTM D 4833.

3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
4. Permittivity: 0.02 per second, minimum; ASTM D 4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

17.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150/C 150M, Type III.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33/C 33M, 3/8-inch nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869/C 869M.
5. Water: ASTM C 94/C 94M.
6. Air-Entraining Admixture: ASTM C 260/C 260M.

B. Produce low-density, controlled low-strength material with the following physical properties:

1. Compressive Strength: 500 psi, when tested according to ASTM C 495/C 495M.

C. Produce conventional-weight, controlled low-strength material with 500 compressive strength when tested according to ASTM C 495/C 495M.

17.4 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.

4. Blue: Water systems.
5. Green: Sewer systems.

B. Detectable Warning Tape: Acid and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 18 - EXECUTION

18.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

18.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

18.3 EXPLOSIVES

A. Explosives: Do not use explosives.

18.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

    a. 24 inches outside of concrete forms other than at footings.
    b. 12 inches outside of concrete forms at footings.
    c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    e. 6 inches beneath bottom of concrete slabs-on-grade.
    f. 6 inches beneath pipe in trenches and the greater of 12 inches wider than pipe.

18.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

18.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

18.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

18.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than approximately 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

18.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

18.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

18.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

18.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of subbase material free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

    a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

F. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

G. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

18.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use satisfactory soil material or engineered fill.
4. Under building slabs, use satisfactory soil material or engineered fill.
5. Under footings and foundations, use satisfactory soil material or engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

18.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within a range of -3 to +2percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

18.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at **98** percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 98 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

18.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch .

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straight edge.

18.17 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.
2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

18.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course to required crown elevations and cross-slope grades.
4. Place subbase course 6 inches or less in compacted thickness in a single layer.
5. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
6. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95percent of maximum dry unit weight according to ASTM D 698.

18.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

18.20 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft or less of paved area or building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet] or less of wall length but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

18.21 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

18.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 312319

DEWATERING

PART 19 - GENERAL

19.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

19.2 SUMMARY

A. Section includes construction dewatering.

B. Related Requirements:

1. Section 013233 "Photographic Documentation" for recording preexisting conditions and dewatering system progress.
2. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.
3. Section 334600 "Subdrainage" for permanent foundation wall, underfloor, and footing drainage.

19.3 ALLOWANCES

A. Dewatering observation wells are part of dewatering.

19.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
3. Review geotechnical report.
4. Review proposed site clearing and excavations.
5. Review existing utilities and subsurface conditions.
6. Review observation and monitoring of dewatering system.

19.5 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

19.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer land surveyor and professional engineer.

B. Field quality-control reports.

C. Existing Conditions: Using photographs, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

19.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

19.8 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.

2. The geotechnical report is included elsewhere in Project Manual.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 20 - PRODUCTS

20.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 21 - EXECUTION

21.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, which are specified in the Erosion Control Plans during dewatering operations.

21.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

21.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

21.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

21.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION

SECTION 312333

TRENCHING AND BACKFILLING

PART 4 - GENERAL

4.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

4.2 SUMMARY

A. Section Includes:

1. Furnishing all labor, equipment and materials in the performance of trench excavation and backfill for pipelines, conduits and ducts as shown on the Contract Drawings.

4.3 DEFINITIONS

A. Bedding: The area above the trench bottom (or foundation) up to a level line at the bottom of the barrel of the pipe, and horizontally from one trench sidewall to the opposite sidewall.

B. Final Backfill: The area above a plane 18-inches above the top of the barrel of the pipe.

C. Foundation: The area beneath the bedding, sometimes also referred to as trench stabilization.

D. Haunching: Material placed above the bottom of the barrel of the pipe (from the bedding) up to a specified height above the bottom of the barrel of the pipe (usually the springline of the pipe), and horizontally from one trench sidewall to the opposite sidewall.

E. Initial Backfill: Portion of trench backfill extending from the haunching material up to a level plane 18-inches above the top of the barrel of the pipe, and horizontally from one trench sidewall to the opposite sidewall.

F. Pipe Embedment: Portion of trench backfill that consists of bedding, haunching and initial backfill.

G. Rock: Any material which cannot be excavated with conventional excavation equipment, and is removed by drilling and blasting, and occupies an original volume of at least one-half cubic yard. This includes the excavation of all solid rock, such as limestone or sandstone occurring in mass or ledge formation or of such character as to warrant removal by blasting, and it shall also include the removal of boulders equal to or greater than one-half cubic yard in size.

H. Unsatisfactory Materials: Materials classified by ASTM D 2487 as OL, OH, MH, CH, and PT are unsatisfactory in-situ and as fill. Unsatisfactory materials also include those materials containing roots and other organic matter, trash, debris, frozen materials, and stones larger than 6 inches. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction.

4.4 SYSTEM DESCRIPTION

A. Excavation shall include the removal of any trees, stumps, brush, debris or other obstacles which remain after the clearing and grubbing operations, which may obstruct the work, and the excavation and removal of all earth, rock or other materials to the extent necessary to install the pipe and appurtenances in conformance with the lines and grades shown on the Contract Drawings and as specified.

B. Backfill shall include the refilling and compaction of the fill in the trenches and excavations up to the surrounding ground surface or road grade at crossing.

C. The pipe zone of the trench is divided into five specific areas: Foundation, Bedding, Hauching, Initial Backfill, and Final Backfill.

D. The choice of method, means, techniques and equipment rests with the CONTRACTOR. The CONTRACTOR shall select the method and equipment for trench excavation and backfill depending upon the type of material to be excavated and backfilled, the depth of excavation, the amount of space available for operation of equipment, storage of excavated material, proximity of man-made improvements to be protected, available easement or rights-of-way and prevailing practice in the area.

4.5 PERFORMANCE REQUIREMENTS

A. Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The CONTRACTOR shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P “Excavation, Trenching & Shoring” as described in OSHA 2226.

4.6 SUBMITTALS

A. Conform to the requirements of Section 01330 – SUBMITTAL PROCEDURES.

B. Submit planned typical method of excavation, backfill placement and compaction including:

1. Trench widths.
2. Procedures for foundation and pipe zone bedding placement, and trench backfill compaction.

3. Procedures for assuring compaction against undisturbed soil when pre-manufactured trench safety systems are proposed.

C. Submit backfill material sources and product quality information.

D. Submit record of location of utilities as installed, referenced to survey control points. Include locations of utilities encountered or rerouted. Give stations, horizontal dimensions, elevations, inverts and gradients.

4.7 QUALITY ASSURANCE

A. Density: All references to "maximum dry density" shall mean the maximum dry density defined by the "Maximum density-Optimum Moisture Test", ASTM D 698. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet the requirements of ASTM D 1556, "Density of Soil in Place by the Sand Cone Method", ASTM D 2937, "Density of Soil in Place by the Drive-Cylinder Method" or ASTM D 2922, "density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)".

PART 5 - PRODUCTS

5.1 PLASTIC MARKING TAPE

A. Plastic marking tape shall be acid and alkali-resistant polyethylene film, 4 inches wide with a minimum thickness of 0.004 inches, of a type specifically manufactured for marking and locating underground utilities. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise

B. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 12 inches deep. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion.

C. Tape color shall be in accordance with APWA Uniform Color Code for Temporary Marking of Underground Facilities, and shall bear a continuous printed inscription, in minimum 1-inch high, permanent black lettering, describing the specific utility.

COLOR	FACILITY
Red	Electric power lines, cables, conduit, and lighting cables.
Orange	Telephone, telegraph, television, communicating alarms, or conduit
Yellow	Gas, oil, steam, petroleum, or other gaseous or dangerous materials
Blue	Water systems
Green	Sewer systems and drain lines
Purple	Reclaimed water, irrigation, and slurry lines

Table 1: Tape Color

5.2 TRENCH FOUNDATION MATERIALS

A. Crushed stone shall be crushed limestone, Size No. 57 as determined by the Tennessee Department of Transportation specifications.

5.3 BEDDING AND HAUNCHING MATERIALS

A. Unless shown on the Contract Drawings or specified otherwise, bedding and haunching materials shall be as follows:

1. Gravity Sewers: Crushed stone as specified under Trench Foundation Materials.

2. Gravity Sewer Services: Crushed stone as specified below.

3. PVC Force Mains and Pressure Sewers: Crushed stone as specified below.

4. DIP Pressure Sewers, DIP Water mains, and DIP Force Mains: Earth materials as specified below.

5. Conduits: Earth materials as specified below.

B. Bedding and haunching material under all pavement areas or where the trench is within three feet of the pavement edge shall be crushed stone.

C. Where rock is encountered, crushed stone shall be used.

D. Earth materials utilized for bedding and haunching shall be suitable materials selected from materials excavated from the trench. Suitable materials shall be clean and free of rock larger than 3-inches

5.4 INITIAL BACKFILL

A. Initial backfill material shall be earth materials or crushed stone as specified for bedding and haunching materials.

B. Earth materials utilized for initial backfill shall be suitable materials selected from materials excavated from the trench. Suitable materials shall be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements.

C. When necessary, initial backfill materials shall be moistened to facilitate compaction by tamping. If materials excavated from the trench are not suitable for use as initial backfill material, provide select material conforming to the requirements of this Section.

5.5 FINAL BACKFILL

A. Final backfill material shall be general excavated earth materials, shall not contain rock larger than 3-inches at its greatest diameter, cinders, stumps, limbs, man-made wastes and other suitable materials, If materials excavated from the trench are not suitable for use as final backfill material, provide select material conforming to the requirements of this Section.

B. Final backfill in roadways shall be crushed stone.

5.6 FLOWABLE FILL

A. Select and proportion ingredients to obtain a compressive strength between 50 psi and 150 psi at 28 days in accordance with ASTM D4832.

B. Materials shall be as follows: Cement – ASTM C150, Type I or Type II; Aggregate – ASTM C33, Size 7; Fly ash (if used) – ASTM C618, Class C; Water – clean, potable, containing less than 500 ppm of chlorides.

5.7 SELECT BACKFILL

A. Select backfill shall be materials which meet the requirements as specified for bedding, haunching, initial backfill or final backfill materials, including compaction requirements.

5.8 CONCRETE

A. Concrete for bedding, haunching, initial backfill, anchors or encasement shall be ASTM C150 Type II, and have a compressive strength of not less than 3,500 psi, with not less than six bags of cement per cubic yard and a slump between 5 and 7-inches.

B. Course Aggregate shall be ASTM No. 57, No. 67 or No. 7, unless otherwise indicated. Fine Aggregate shall be ASTM C33.

C. Air entraining admixtures: ASTM C260

D. Chemical Admixtures
   1. Water Reducers: ASTM C494, Type A.
   2. Water Reducing Retarders: ASTM 494, Type D
   3. High Range Water Reducers (Superplaticizers): ASTM C494, Types F and G.

4. Prohibited Admixtures: Admixtures containing calcium chloride, thiocyanate, or materials that contribute free chloride ions in excess of 0.1 percent by weight of cement.

E. Reinforcing Steel:
   1. Use new billet steel bars conforming to ASTM A615, ASTM A767 or ASTM A775, grade 40 or grade 60, as shown on Drawings. Use deformed bars except where smooth bars are specified. When placed in work, keep steel free of dirt, scale, loose or flaky rust, paint, oil or other harmful materials.
   2. Where shown, use welded wire fabric with wire conforming to ASTM A185 or ASTM A884. Supply gauge and spacing shown, with longitudinal and transverse wires electrically welded together at points of intersection with welds strong enough not to be broken during handling or placing.
   3. Wire: ASTM A82. Use 16 ½ gauge minimum for tie wire, unless otherwise indicated.

F. Form Work Materials
   1. Lumber and Plywood: Seasoned and of good quality, free form loose or unsound knots, knot holes, twists, shakes, decay and other imperfections which would affect strength or impair finished surface of concrete. Use S4S lumber for facing or sheathing. Forms for bottoms of caps: At least 2-inch (nominal) lumber or ¾-inch form plywood backed adequately to prevent misalignment. For general use, provide lumber of 1-inch nominal thickness or form plywood of approved thickness.
   2. Form Work for Exposed Concrete Indicated to Receive Rubbed Finish: Form or form-lining surfaces free of irregularities; plywood of ¼-inch minimum thickness, preferably oiled at mill.
   3. Chamfer Strips and Similar Moldings: Redwood, cypress, or pine that will not split when nailed and which can be maintained to true line. Use mill-cut molding dressed on all faces.
   4. Form Ties: Metal or fiberglass of approved type with tie holes not larger than 7/8-inch in diameter. Do not use wire ties or snap ties.
   5. Metal Forms: Clean and in good condition, free from dents and rust, grease, or other foreign materials that tend to disfigure or discolor concrete in gauge and conditions capable of supporting concrete and construction loads without significant distortion. Countersink bolt and rivet heads on facing sides. Use only meter forms which present smooth surface and which line up properly.

PART 6 - EXECUTION

6.1 PREPARATION

A. Establish traffic control to conform to the Contract Specifications. Maintain barricades, and warning light and signs for streets and intersections affected by Work as directed.

B. Topsoil and grass shall be stripped a minimum of 6-inches over the trench excavation site and stockpiled separately for replacement over the finished grading areas.

Dispose of all debris and other objectionable matter in a manner that complies with all applicable Laws and Regulations. CONTRACTOR shall no damage or remove existing trees, shrubs, or other vegetation on the Site to be preserved for the permanent landscape, as noted on the Contract Drawings, listing in the Contract Specifications, marked on the Site, or identified by OWNER or ENGINEER.

C. If area to be excavated is occupied by trees, brush, or other vegetation growth, clear such growth and grub the excavated area in accordance with Section 02230 – SITE CLEARING.

D. Remove existing pavements and structures, including sidewalks, and driveways.

E. Install and operate necessary dewatering and surface-water control measures as needed.

6.2 TRENCH EXCAVATION

A. Except as otherwise specified or shown on the Contract Drawings, install underground utilities in open cut trenches with vertical sides.

B. Trenches shall be excavated to the lines and grades shown on the Contract Drawings with the centerlines of the trenches on the centerlines of the pipes and to the dimensions which provide the proper support and protection of the pipe and other structures and accessories. Before laying the pipe, the CONTRACTOR shall open the trench far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.

C. Width:

1. The sides of all trenches shall be vertical to a minimum of one foot above the top of the pipe. Unless otherwise indicated on the Contract Drawings, the maximum trench width shall be as follows.

Nominal Pipe Size (in)	Minimum Trench Width (in)
Less than 4	**12**
4 to 12	**O.D. + 12**
12 to 30	**O.D. + 24**
30 to 42	**O.D. + 36**
Greater than 42	**O.D. + 48**

D. Depth:

1. The trenches shall be excavated to the required depth or elevation which allows for the placement of the pipe and bedding to the thickness shown on the Contract Drawings.

2. Electrical and gas conduits shall be buried to a minimum depth of 30-inches or as shown on the Contract Drawings.

3. Water Mains and Force Mains:
    a. Excavate trenches to provide a minimum cover not less than three feet(0.91 meters) below the surface of the ground when laid through wooded areas, fields and other such areas outside the pavement or traveled surface of highways and roadways.
    The minimum depth of cover shall not be less than 3.5 feet for pipe lines laid within the pavement, traveled surface, or shoulder of any highway and/or roadway.
    Any line crossing a State Highway shall have a minimum depth of cover of four feet. Depth of cover at ditches on State Highways shall be 36-inches minimum. All depths of cover are measured to the top of the pipe.

    b. Increase the depth of cover where specifically shown on the Contract Drawings and where necessary to avoid interference with underground utilities and obstructions.

4. Where rock is encountered in trenches, excavate to the minimum depth of 12-inches below the pipeline which will provide clearance below the pipe barrel of 8-inches for all pipe, valves and manholes. Remove boulders and stones to provide a minimum of 12-inches clearance between the rock and any part of the pipe, manhole or accessory.

E. Excavated Materials

1. Excavated materials shall be placed adjacent to the Work to be used for backfilling as required. Topsoil shall be carefully separated and lastly placed in its original location.

2. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause any drainage problems. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements. Protect backfill material to be used on site.

3. Do not place stockpiles of excess excavated materials on streets and adjacent properties.

F. Trench excavation shall proceed far enough ahead of pipe laying to reveal any obstructions that might necessitate changing the line or grade of the pipeline. The trench shall be reasonably straight and uniform in grade. Trenches shall be kept free of water during the construction of the pipeline and removal of water shall be at the CONTRACTOR's expense. Trench excavation shall proceed in a continuous manner from the beginning of the pipeline to the end.

G. Unless specifically authorized by the ENGINEER, no skipping by obstacles such as rock, road crossings, existing utilities, etc. shall be permitted. If skips are authorized by the ENGINEER and the CONTRACTOR does not close the resulting gaps in the pipeline in a timely manner, the ENGINEER may require the CONTRACTOR to discontinue operations until the gaps are closed.

6.3 SHORING OF TRENCH WALLS

A. Compliance with all OSHA standards is required in determining where and in what manner sheeting, shoring, and bracing are to be done.

B. Install special shoring in advance of trench excavation or simultaneously with trench excavation, so that soils within full height of trench excavation walls will remain laterally supported at all times.

C. Where excavations are made adjacent to existing buildings or structures or in paved streets or alleys, take particular care to sheet, shore, and brace the sides of the excavation so as to prevent any undermining of or settlement beneath such structures or pavement.

D. For all types of shoring, support trench walls in pipe embedment zone throughout installation. Provide trench wall supports sufficiently tight to prevent washing trench wall soil out from behind trench wall support.

E. Leave sheeting driven into or below pipe embedment zone in place to preclude loss of support of foundation and embedment materials, unless otherwise directed by ENGINEER. Leave ranger, walers, and braces in place as long as required to support sheeting, which has been cut off, and trench wall in vicinity of pipe zone.

F. If sheeting or other shoring is used below top of pipe embedment zone, do not disturb pipe foundation and embedment materials by subsequent removal. Maximum thickness of removable sheeting extending into embedment zone shall be equivalent of 1-inch thick steel plate. As sheeting is removed, fill in voids left with grouting material.

6.4 ROCK EXCAVATION

A. Depth of rock excavation shall be carried to a minimum depth of 6-inches below the bottom of the pipe.

B. Provide licensed, experiences workmen to perform blasting. Conduct blasting operations in accordance with all existing ordinances and regulations. Protect all building and structures from the effects of the blast. Repair any resulting damage. If the CONTRACTOR repeatedly used excessive blasting charges or blasts in an unsafe or improper manner, the ENGINEER may direct the CONTRACTOR to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.

C. Dispose of rock off site that is surplus or not suitable for use as rip rap or backfill.

D. The CONTRACTOR shall notify the ENGINEER prior to any blasting. Additionally, the CONTRACTOR shall notify the ENGINEER before any charge is set.

E. Following review by the ENGINEER regarding the proximity of permanent buildings and structures to the lasting site, the ENGINEER may direct the CONTRACTOR to employ an independent, qualified specialty subcontractor, approved by ENGINEER, to monitor the blasting by use of seismograph, identify the areas where light charges must be used, conduct pre-blast and post-blast inspections of structures, including photographs or videos, and maintain a detailed written log.

6.5 DEWATERING EXCAVATIONS

A. The CONTRACTOR, at their own expense, shall provide adequate facilities for promptly removing water from all excavations. Dewater excavation continuously to maintain a water level two feet below the bottom of the trench.

B. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water running into the excavation.

C. There shall be sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavations. Where the pipe line crosses natural drainage channels, the Work shall be conducted in such a manner that unnecessary damage or delays in the execution of the work will be prevented. Provision shall be made for the satisfactory disposal of surface water to prevent damage to public or private property.

D. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete or backfilling.

E. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least two feet below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump two feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operation.

F. Dewater by use of a well point system when pumping from sumps does not lower the water level two feet below the trench bottom. Where soil conditions dictate, the CONTRACTOR shall construct well points cased in sand wicks. The casing, 6 to 10-inches in diameter, shall be jetted into the ground, followed by the installation of the well point, filling casing with sand and withdrawing the casing.

6.6 TRENCH FOUNDATION AND STABILIZATION

A. The bottom of the trench shall provide a foundation to support the pipe and its specified bedding. The trench bottom shall be graded to support the pipe and bedding uniformly throughout its length and width.

B. If, after dewatering as specified above, the trench bottom is spongy, or if the trench bottom does not provide firm, stable footing and the material at the bottom of the trench will still not adequately support the pipe, the trench will be determined to be unsuitable and the ENGINEER shall then authorize payment for trench stabilization.

C. Should the undisturbed material encountered at the trench bottom constitute, in the opinion of the ENGINEER, an unstable foundation for the pipe, the CONTRACTOR shall be required to remove such unstable material and fill the trench to the proper subgrade with crushed stone or class "C' concrete.

D. Where trench stabilization is provided, the trench stabilization material shall be compacted to at least 90 percent of the maximum dry density, unless shown or specified otherwise.

6.7 BEDDING AND HAUNCHING

A. Bedding Classifications:

1. Class "A" (Bedding Factor -2.8): Excavate the bottom of the trench flat at a minimum depth as down on the Contract Drawings, below the bottom of the pipe barrel. Lay pipe to line and grade on concrete block. Place concrete to the full width of the trench and to a height of one-fourth of the outside diameter of the pipe above the invert.

2. Class "B" (Bedding factor – 1.9): Excavate the bottom of the trench flat at a minimum depth as shown on the Contract Drawings, below the bottom of the pipe barrel. Place and compact bedding material to the proper grade. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to the centerline of the pipe.

3. Class "C" (Bedding Factor – 1.5): Excavate the bottom of the trench flat at a minimum depth as shown on the Contract Drawings, below the bottom of the pipe barrel. Place and compact bedding material to the proper grade. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to a height of one-fourth the outside diameter of the pipe above the bottom of the pipe barrel.

4. Type 5: Excavate the bottom of the trench flat at a minimum depth as shown on the Contract Drawings, below the bottom of the pipe barrel. Place and compact bedding material to the proper grade before installing pipe. After the pipe has been brought to the proper grade, haunching material shall be carefully placed by hand and compacted to the top of the pipe.

B. Bedding material shall be placed to provide uniform support along the bottom of the pipe and to place and maintain the pipe at the proper elevation. The initial layer of bedding placed to receive the pipe shall be brought to the grade and dimensions indicated on the Contract Drawings, and the pipe shall be placed thereon and brought to grade by tamping the bedding material or by

removal of the slight excess mount of the bedding material under the pipe. Adjustment to grade line shall be made by scraping away or filling with bedding material. Wedging or blocking up of pipe shall not be permitted. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except immediately at the joint. All bedding shall extend the full width of the trench bottom. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders or large dirt clods.

C. At each joint, excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.

D. After the pipe section is properly placed, add the haunching material to the specified depth. The haunching material shall be shovel sliced, tamped, vigorously chinked or otherwise consolidated to provide uniform support of the pipe barrel and to fill completely the voids under the pipe, including the bell hole. Prior to placement of the haunching material, the bedding shall be clean and free of any water, loose rocks, boulders or dirt clods.

E. Gravity Sewers and Accessories: Lay PVC pipe with minimum Class “B” bedding. Lay all other pipe with Class “C” bedding, unless shown or specified otherwise.

F. Manholes: Excavate to a minimum of 12-inches below the planned elevation of the base of the manhole. Place and compact crushed stone bedding material to the required grade before constructing the manhole.

G. Electrical and Gas Conduits: Earth material shall be used for bedding, unless otherwise directed by the Contract Documents.

H. Ductile Iron Pipe: Type 5 bedding and haunching shall be utilized unless otherwise shown on the Contract Drawings.

I. Bedding and haunching materials under pipe, manholes and accessories shall be compacted to a minimum of 90 percent of the maximum dry density, unless shown or specified otherwise.

6.8 INITIAL BACKFILL

A. Initial backfill shall be placed to anchor the pipe, protect the pipe from damage by subsequent backfill and ensure the uniform distribution of the loads over the top of the pipe. Backfilling pipeline trenches shall not begin under any circumstances until pipe has been verified for proper placement in the trench by the ENGINEER. This includes work not done during normal business hours.

B. Place initial backfill carefully around the pipe in uniform layers to a depth of at least 18-inches above the pipe barrel. Layer depths shall be a maximum of 6-inches for pipe 18-inches in diameter and smaller and a maximum of 12-inches for pipe larger than 18-inches in diameter.

C. Backfill on both sides of the pipe simultaneously to prevent side pressures.

D. Compact each layer thoroughly with suitable hand tools or tamping equipment.

E. Initial backfill shall be compacted to a minimum 90 percent of the maximum dry density, unless shown or specified otherwise.

F. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.

G. In areas where the trench is cut into rock or where suitable backfill is unavailable, crushed stone shall encase the pipe.

6.9 CONCRETE ENCASEMENT

A. Where concrete encasement is shown on the Contract Drawings, excavate the trench to provide a minimum width and depth of 24-inches plus the diameter of the casing pipe. Lay casing and carrier pipe to line and grade on concrete blocks. In lieu of bedding, haunching and initial backfill, place concrete to the full width of the trench and to a height of not less than 18-inches above the casing pipe. Encasement for electrical ducts shall be as shown on the Contract Drawings. Do not backfill the trench for a period of at least 24 hours after concrete is placed.

B. For pipes under structures, provide concrete backfill.

6.10 FINAL BACKFILL

A. Backfill carefully to restore the ground surface to its original condition.

B. The top 6-inches shall be topsoil obtained as specified in Article 3.1 of this Section.

C. Excavated material which is unsuitable for backfilling and excess material shall be disposed of at no additional cost to the OWNER in a manner approved by the ENGINEER. Surplus soil may be neatly distributed and spread over the site, if approved by the ENGINEER. If such spreading is allowed, the site shall be left in a clean and slightly condition and shall not affect pre-construction drainage patterns. Surplus rock from the trenching operations shall be removed from the site.

D. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.

E. After initial backfill material has been placed and compacted, backfill with final backfill material, the backfill material may be shoveled into the trench without compacting, and heaped over whenever, in the opinion of the ENGINEER, this method of backfilling may be used without inconvenience to the public. Where street paving or shoulders are to be repaired, the

CONTRACTOR will be required to tamp or paddle all backfill as described hereinafter or may be required to backfill the entire trench with crushed stone.

F. If trench settles, re-fill and grade the surface to conform to the adjacent surfaces.

G. Final backfill shall be compacted to a minimum 90 percent of the maximum dry density, unless specified otherwise.

6.11 BACKFILL UNDER ROADS

A. The CONTRACTOR should familiarize their selves with the requirements of the County or State Highway department within whose rights-of-way the CONTRACTOR is working.

B. Crossing of county roads will be open cut with permission of the County Highway department. Depth of cover shall be minimum four feet as measured form the top of the pipe at the crossing. Depth of cover shall be a minimum 36-inches at ditch lines or at the toe of slope.

C. Pipe line crossing of U.S. and State highways and where otherwise directed by the ENGINEER will be made by boring and jacking with a smooth wall steel casing pipe under the roadbed, as directed in Section 02320 – BORE AND JACK CASINGS, and inserting the pipe in the casing. Where boring is required, holes shall be bored under the highway at least four feet below the surface with no disturbance to the surface or as otherwise directed by the ENGINEER.

D. If approval by the State is obtained, open cutting of crossings may be permitted. Installations by open-trench methods shall comply with highway department specifications.

E. Where the pipe is installed under current or future roadway paved surfaces, or where otherwise required by the ENGINEER, crushed stone backfill shall be placed in layers not exceeding 6-inches and firmly tamped into place by tampers or rammers. Mechanical tamping will be required on lines where street pavement is to be replaced immediately after the backfilling is completed. The ENGINEER may also require paddling where, in their opinion, it is necessary for proper compaction.

F. In backfilling the pipeline trench in areas where the line is laid in the paved or graveled shoulder of a State Highway, all of the requirements in the preceding paragraph shall be met including that of placing all backfill in the trench in 6-inch lifts and tamping all backfill. In addition, all backfill in such areas shall be chert or crushed stone.

G. Open cut crossing of State Highways or paved city or county streets will be backfilled with crushed stone. Crushed stone will be required unless otherwise directed by the ENGINEER. Where the lines are laid within five feet of pavement of a city or county street, crushed stone backfill will be utilized.

6.12 BACKFILL ALONG RESTRAINED JOINT PIPE

A. Backfill along restrained joint pipe shall be compacted to a minimum 90 percent of the maximum dry density.

6.13 FIELD QUALITY CONTROL

A. Sources and Evaluation Testing: Testing of materials to certify conformance with the Contract Documents shall be performed by an independent testing laboratory. The CONTRACTOR's testing laboratory shall perform test, at no cost to the OWNER, upon change of source and at sufficient intervals during the Work to certify conformance of all select material furnished for use on this Project.

B. Earthwork operations, acceptability of excavated materials for bedding or backfill, and placing and compaction of bedding and backfill is subject to inspection by the ENGINEER.

Foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer who shall verify suitable bearing and construction.

C. Perform tests and inspections.

1. If in the opinion of the ENGINEER, compaction has not been sufficient, soil testing will be performed by an independent testing laboratory selected by OWNER. Payment for soil testing shall be made by CONTRACTOR if results show that compaction does not meet requirements of the Contract Documents.

D. The sols testing laboratory is responsible for the following:

1. Compaction test in accordance with Article 1.2 of this Section.

2. Field density tests for each two foot of lift, one test for each 2,000 feet of pipe installed or more frequently if ordered by the ENGINEER.

3. Inspecting and testing stripped site, subgrades and proposed fill materials.

E. The CONTRACTOR's duties relative to testing include:

1. Notifying laboratory of conditions requiring testing.
2. Coordinating with laboratory for field testing.
3. Paying costs for additional testing performed beyond the scope of that required where testing reveal non-conformance with specified requirements.
4. Providing excavation as necessary for laboratory personnel to conduct tests.

END OF SECTION

SECTION 321013
REMOVING AND REPLACING PAVEMENT

PART 1 - GENERAL

1.1 SCOPE

A. The work to be performed under this section shall consist of removing and replacing existing pavement, sidewalks and curbs in paved areas where such have been removed for construction of watermains, sanitary sewers, sanitary sewer manholes and all other associated appurtenances and structures.

1.2 SUBMITTALS

A. Certificates: Provide certificates stating that materials supplied comply with Specifications. Certificates shall be signed by the asphalt producer and the Contractor.

1.3 CONDITIONS

A. Weather Limitations
   1. Do not conduct paving operations when surface is wet or contains excess of moisture which would prevent uniform distribution and required penetration.
   2. Construct prime and tack coats, and asphaltic courses only when atmospheric temperature in the shade is above 40 degrees F, when the underlying base is dry and when weather is not rainy.
   3. Place base course when air temperature is above 35 degrees F and rising.

B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mineral Aggregate Base Course: Mineral aggregate base course shall conform to the requirements of the Tennessee Department of Transportation Bureau of Highways Standard Specifications for Road and Bridge Construction, Section 303, Type A base, Grading D.

B. Bituminous Plant Mix Base (Hot Mix): The base of all paved roadways shall conform to the requirements of Section 307 of the Tennessee Department of Transportation Bureau of Highways Standard Specifications for Road and Bridge Construction.

C. Bituminous Sand-Gravel Binder Course: The binder course of all paved roadways shall conform to the requirements of Section 409 of the Tennessee Department of Transportation Bureau of Highways Standard Specifications for Road and Bridge Construction.

D. Asphaltic Concrete Surface (Hot Mix): The surface course for all pavement shall conform to the requirements of the Tennessee Department of Transportation Bureau of Highways Standard Specifications for Road and Bridge Construction, Section 411, Grading "E".

E. Double Bituminous Surface Treatment: The surface for all pavements shall conform to the requirements of the Tennessee Department of Transportation Bureau of Highways Standard Specifications for Road and Bridge Construction, Section 404.

F. Concrete: Provide concrete and reinforcing for concrete pavement or base courses in accordance with the requirements of the Tennessee Department of Transportation Bureau of Highways Standard Specifications for Road and Bridge Construction, Section 501.

G. Special Surfaces: Where driveways or roadways are disturbed or damaged which are constructed of specialty type surfaces, e.g. brick or stone, these driveways and roadways shall be restored utilizing similar, if not original, materials. Where the nature of these surfaces' dictates, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

2.2 TYPES OF PAVEMENTS

A. General: All existing pavement removed, destroyed or damaged by construction shall be replaced with the same type and thickness of pavement as that existing prior to construction, unless otherwise directed by the Engineer. Materials, equipment and construction methods used for paving work shall conform to the Tennessee Department of Transportation Bureau of Highways specifications applicable to the particular type required for replacement, repair or new pavements.

B. Aggregate Base: Aggregate base shall be constructed in accordance with the requirements of Section 303, Type A base of the Tennessee Department of Transportation Bureau of Highways Standard Specifications for Road and Bridge Construction. Material shall be mixed and placed by the stationary plant method. If the finished compacted base course depth is 6-inches or more, the course shall be constructed in two or more layers of approximately equal thickness.

C. Concrete Pavement: Concrete pavement or base courses shall be replaced with concrete. The surface finish of the replaced concrete pavement shall conform to that of the existing pavement. The surface of the replaced concrete base course shall be left rough. The slab depth shall be equivalent to the existing concrete pavement or base course, but in no case less than 6-inches thick. Transverse and longitudinal joints removed from concrete pavement shall be replaced at the same locations and to the same types and dimensions as those removed.

Concrete pavements or concrete base courses shall be reinforced and shall conform to the Tennessee Department of Transportation Bureau of Highways Standard Specifications, Section 501.

D. Asphalt Concrete Base, Binder and Surface Course: Asphalt concrete base, binder and surface course construction shall conform to the Tennessee Department of Transportation Bureau of Highways Standard Specifications, Section 307 for bituminous plant mix base course, Section 409 for bituminous sand-gravel binder course and Section 411, Grading "E" for asphalt concrete surface course. The pavement mixture shall not be spread until the designated surface has been previously cleaned and prepared, is intact, compacted as specified herein, properly cured, dry and the prime and/or tack coat has been applied. Apply and compact the asphalt concrete in maximum layer thickness by asphalt spreader equipment of design and operation approved by the Engineer. After compaction, the asphalt concrete shall be smooth and true to established profiles and sections. Immediately correct any high, low or defective areas by cutting out the course, replacing with fresh hot mix, and immediately compacting to conform and thoroughly bond to the surrounding area.

E. Double Bituminous Surface Treatment: Double bituminous surface treatment shall be replaced with a minimum thickness of 1-inch conforming to Section 404 of the Tennessee Department of Transportation Bureau of Highways Standard Specifications. No bituminous surface shall be installed between October 15 and April 15, and only when the air and pavement temperatures in the shade are above 60 degrees F.

F. Gravel Surfaces: Existing gravel road, drive and parking area replacement shall meet the requirements of aggregate base course. This surfacing may be authorized by the Engineer as a temporary surface for paved streets until replacement of hard surfaced pavement is authorized.

G. Temporary Measures: During the time period between pavement removal and complete replacement of permanent pavement, maintain highways, streets and roadways open to traffic. This may be accomplished by any means necessary to the Contractor such as the use of steel running plates anchored to prevent movement, cold patch asphalt, hot mix asphalt, or any alternative temporary methods approved by the City of Knoxville. The backfill above the pipe shall be compacted, as specified elsewhere, up to the existing pavement surface to provide support for the steel running plates. All pavement shall be permanently replaced within seven calendar days of its removal.

PART 3 - EXECUTION

3.1 REMOVING PAVEMENT

A. General: Remove existing pavement as necessary for installing the pipe line and appurtenances.

B. Marking: Before removing any pavement, mark the pavement neatly paralleling pipe lines and existing street lines. Space the marks the width of the trench.

C. Breaking: Break asphalt pavement along the marks using pavement shearing equipment, jack hammers or other suitable tools. Break concrete pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.

D. Machine Pulling: Do not pull pavement with machines until the pavement is completely broken and separated from pavement to remain.

E. Damage to Adjacent Pavement: Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.

F. Damage to Traffic Signal Loops: Any pavement removal which will include removal of traffic signal loops embedded in the pavement shall be coordinated with the Traffic Engineering Department having jurisdiction over the traffic signal five days prior to pavement removal.

G. Sidewalk: Remove and replace any sidewalks disturbed by construction for their full width and to the nearest undisturbed joint. Replacement shall conform to the Owner's specifications.

H. Curbs: Tunnel under or remove and replace any curb disturbed by construction to the nearest undisturbed joint. Replacement shall conform to the Owner's specifications.

3.2 REPLACING PAVEMENT

A. Preparation of Subgrade: During backfilling and compaction of the backfill, arrange to have the compaction tested by an independent testing laboratory. After compaction testing has been satisfactorily completed, replace all pavements, sidewalks and curbs removed.
   1. The existing street pavement or surface shall be removed along the lines of the work for the allowable width specified for the trench or structure. After the installation of the sewerage or water works facilities and after the backfill has been compacted suitably, the additional width of pavement to be removed, as shown on the Drawings, shall be done immediately prior to replacing the pavement.
   2. Trench backfill shall be compacted for the full depth of the trench.

B. Pavement Replacement
   1. Prior to replacing pavement, make a final cut in concrete pavement 12-inches back from the edge of the damaged pavement with a concrete saw. Remove asphalt pavement 12-inches back from the edge of the damaged pavement using pavement shearing equipment, jack hammers or other suitable tools.
   2. Replace all street and roadway pavement as shown on the Drawings. Replace driveways, sidewalks and curbs with the same material, to nearest existing undisturbed construction joint and to the same dimensions as those existing.

3. If the temporary paving is to be replaced, the top 6-inches shall be removed the base for the bituminous surface shall be placed.
4. Following this preparation, the crushed stone base shall be primed with a suitable bituminous material and surfaced with the proper type of bituminous surface treatment.
5. Where the paved surface is to be replaced with asphaltic concrete pavement, concrete pavement or with a concrete base and a surface course, the temporary surface and any necessary backfill material, additional existing paving and new excavation shall be removed to the depth and width shown on the Drawings. All edges of the existing pavement shall be cut to a straight, vertical edge. Care shall be used to get a smooth joint between the old and new pavement and to produce an even surface on the completed street. Expansion joints, where applicable, shall be replaced in a manner equal to the original joint.
6. Where driveways or roadways, constructed of specialty type surfaces, e.g. brick or stone are disturbed or damaged, these driveways and roadways shall be restored utilizing similar materials. Where the nature of these surfaces' dictates, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

C. Pavement Striping: Pavement striping removed or paved over shall be replaced with the same type, dimension and material as original unless directed otherwise by the Engineer.

D. Traffic Signal Loops: The replacement or repair of all traffic signal loops removed or damaged during the removal and replacement of pavement shall be coordinated by the Contractor with the Traffic Engineering Department having jurisdiction over each traffic signal. The Contractor shall be responsible for payment of all fees associated with replacement or repair of traffic signal loops.

3.3 MAINTENANCE

A. The Contractor shall maintain the surfaces of roadways built and pavements replaced until the acceptance of the Project. Maintenance shall include replacement, scraping, reshaping, wetting and rerolling as necessary to prevent raveling of the road material, the preservation of reasonably smooth surfaces and the repair of damaged or unsatisfactory surfaces, to the satisfaction of the Engineer. Maintenance shall include sprinkling as may be necessary to abate dust from the gravel surfaces.

3.4 SUPERVISION AND APPROVAL

A. Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. Obtain agency approval of pavement restorations before requesting final payment.

B. Obtain the Engineer's approval of restoration of pavement, such as private roads and drives, that are not the responsibility of a regulatory agency.

C. Complete pavement restoration as soon as possible after backfilling.

3.5 CLEANING

A. The Contractor shall remove all surplus excavation materials and debris from the street surfaces and rights-of-way and shall restore street, roadway or sidewalk surfacing to its original condition.

END OF SECTION

SECTION 321216
ASPHALT PAVING

PART 7 - GENERAL

7.1 SUMMARY

A. Section Includes:
   1. Hot-mix asphalt patching.
   2. Hot-mix asphalt paving.
   3. Pavement-marking paint.

B. Related Sections:

   1. Division 31 Section "Earth Moving" for aggregate subbase and base courses.

7.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

   1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
   2. Job-Mix Designs: For each job mix proposed for the Work.

B. Material Certificates: For each paving material, from manufacturer.

C. Material Test Reports: For each paving material.

7.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the Tennessee Department of Transportation (TDOT).

7.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure. Follow requirements of the Tennessee Department of Transportation specified in “Standard Specifications for Road and Bridge Construction, January 1, 2015” for temperatures allowed for placement of asphalt materials.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F (12.8 deg C), and not exceeding 95 deg F (35 deg C).

PART 8 - PRODUCTS

A. Mineral Aggregate Base will follow the Specifications of the Tennessee Department of Transportation's Section 303 – Mineral Aggregate Base; Mineral Aggregate Base Type A, Grading D.

B. Bituminous Plant Mix Base (Hot Mix) will follow the Specifications of the Tennessee Department of Transportation's Section 307 – Bituminous Plant Mix Base (Hot Mix) for the mix indicated on the plans.

C. Prime Coat will follow the Specifications of the Tennessee Department of Transportation's Section 402 – Prime Coat.

D. Tack Coat will follow the Specifications of the Tennessee Department of Transportation's Section 403 – Tack Coat.

E. Asphaltic Concrete Surface (Hot Mix) will follow the Specifications of the Tennessee Department of Transportation's Section 411 – Asphaltic Concrete Surface (Hot Mix) for the mixes indicated on the plans.

F. Pavement Markings will follow the Specifications of the Tennessee Department of Transportation's Section 716 – Pavement markings for Painted Pavement Markings.

G. Signage will follow the Specifications of the Tennessee Department of Transportation's Section 713 – Highway Signage.

PART 9 - EXECUTION

9.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

9.2 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Re-compact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Follow City of Knoxville requirements for patching asphalt streets as shown in the detail sheet.

9.3 Installation

A. Mineral Aggregate Base will follow the Specifications of the Tennessee Department of Transportation's Section 303 – Mineral Aggregate Base.

B. Bituminous Plant Mix Base (Hot Mix) will follow the Specifications of the Tennessee Department of Transportation's Section 307 – Bituminous Plant Mix Base (Hot Mix).

C. Prime Coat will follow the Specifications of the Tennessee Department of Transportation's Section 402 – Prime Coat.

D. Tack Coat will follow the Specifications of the Tennessee Department of Transportation's Section 403 – Tack Coat.

E. Asphaltic Concrete Surface (Hot Mix) will follow the Specifications of the Tennessee Department of Transportation's Section 411 – Asphaltic Concrete Surface (Hot Mix) for the mix indicated on the plans.

F. Pavement Markings will follow the Specifications of the Tennessee Department of Transportation's Section 716 – Pavement markings for Painted Pavement Markings.

G. Signage will follow the Specifications of the Tennessee Department of Transportation's Section 713 – Highway Signage.

9.4 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Sweep and clean surface to eliminate loose material and dust.

9.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Replace and compact hot-mix asphalt where core tests were taken.

C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

9.6 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose them.

END OF SECTION

SECTION 312500
EROSION AND SEDIMENT CONTROL

PART 10 - GENERAL

10.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

10.2 SUMMARY

A. Section Includes:

1. Implementation of temporary and permanent erosion and sedimentation control.

10.3 SYSTEM DESCRIPTION

A. The work specified in this Section consists of providing, maintaining and removing temporary erosion and sedimentation control.

B. The CONTRACTOR shall follow the latest edition of the Tennessee Erosion and Sedimentation Control Handbook and the City of Knoxville Best Management Practices Manual.

C. Temporary erosion controls include, but or not limited to, grassing, mulching, watering and re-seeding on-site surfaces and spoil and borrow area surfaces, and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the Federal Clean Water Act of 1987.

D. Temporary sedimentation controls include, but or not limited to, silt dams, traps, barriers, filter stone and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the Federal Clean Water Act of 1987, as amended.

E. Basic Principles
1. Conduct the earthwork and excavation activities in such a manner to fit the topography, soil type and condition.
2. Minimize the disturbed area and the duration of exposure to erosion elements.
3. Stabilize disturbed areas immediately.
4. Safely convey run-off from the site to an outlet such that erosion will not be increased off site.

5. Retain sediment on site that was generated on site.
6. Minimize encroachment upon watercourses.

F. Temporary Erosion and Sedimentation Control: In general, temporary erosion and sedimentation control procedures shall be directed toward the following:
1. Preventing soil erosion at the source.
2. Preventing silt and sediment from entering any waterway if soil erosion cannot be prevented.
3. Preventing silt and sediment from migrating downstream in the event it cannot be prevented from entering the waterway.

G. Permanent Erosion Control: Permanent erosion control measures shall be implemented to prevent sedimentation of the waterways and to prevent erosion of the project site.

10.4 DEFINITIONS

A. Temporary Berms: These berms are used temporarily at the top or base of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.

B. Temporary Slope Drains: A temporary slope drain is a facility consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, sod, or other material that may be used to carry water down slopes to reduce erosion.

C. Sediment Structures: Sediment basins, ponds, and traps are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.

D. Check Dams: Check dams are barriers composed of large stones, sand bags, or other non-corrodible materials placed across or partially crossing a natural or constructed drain way.

E. Temporary Silt Fences: Silt fences are temporary sediment barriers consisting of a filter fabric stretched across and attached to supporting posts and entrenched. The silt fence is constructed of synthetic filter fabric, posts, and depending upon the strength of the fabric used, wire fence for support. The filter barrier is constructed of stakes and burlap or synthetic filter fabric.

F. Enhanced Stone Filter Ring: Filter Rings are temporary sediment controls constructed of rip rap and installed at the entrance to storm drains and culverts to enhance settling. Washed stone is placed on the upstream face of the filter ring.

10.5 QUALITY ASSURANCE

A. General: Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated above and in these specifications.

B. Conflicts: Where provisions of pertinent rules and regulations conflict with these specifications, the more stringent provisions shall govern.

PART 11 - PRODUCTS

11.1 MATERIALS

A. Silt Fence

1. Silt fence fabric shall be polymer type netting with a built-in cord running throughout the top edge of the fabric. Posts shall be steel or 4-inch diameter pressure treated fir, southern pine, or hemlock, and shall be a minimum 5 foot in length. Silt fence shall have an equivalent opening size (EOS) of 40 to 100. Silt fence fabric shall have a minimum permeability of 40 gallons per minute per square foot.

2. Silt fence fabric shall be Mirafi 100X, Amoco 1380, or Exxon GTF-100 Series.

3. Wire fence reinforcement shall be a minimum 42 inches in height, a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.

B. Stone rip rap: Use sound, touch, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall be 2.0 or greater. Riprap shall have less than 66% wear when tested in accordance with AASHTO T-96. Riprap shall be in accordance with the Tennessee Department of Transportation Standard Specifications.

C. Inlet Protection

1. Right of Way inlet protection shall be Flexstorm Inlet Filters or Equal.

2. Site Inlet Protection shall be Curlex Sediment Logs manufactured by American Excelsior Company or Equal.

PART 12 - EXECUTION

12.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL INSTALLATION

A. Temporary erosion and sedimentation control procedures should be initially directed toward preventing silt and sediment from entering the waterways. The preferred method is to provide an undisturbed natural buffer, extending a minimal five feet from the water, to filter the run-off. Should this buffer prove infeasible due to construction activities being too close to the water, or if the amount of sediment overwhelms the buffer, the CONTRACTOR shall place silt fences to filter the run-off and, if necessary, place permanent riprap to stabilize the bank.

B. Silt dams, silt fences, traps, barriers, check dams, appurtenances and other temporary measures and devices shall be installed as indicated on the approved plans and working drawing, shall be maintained until no longer needed, and shall them be removed. Deteriorated hay bales and dislodged filter stone shall be replaced with new materials.

C. All erosion and sedimentation control devices, including check dams, shall be inspected by the CONTRACTOR at least twice a week and after each rainfall occurrence and cleaned out and repaired by the CONTRACTOR as necessary. Inspections shall be performed in accordance with the TDEC construction permit requirements.

D. Temporary erosion and sedimentation control devices shall be installed and maintained from the initial land disturbance activity until the satisfactory completion and establishment of permanent erosion control measures. At that time, temporary devices shall be removed.

12.2 PERMANENT EROSION CONTROL

A. Permanent erosion control shall include the following:

1. Restoring the work site to its original contours, unless shown otherwise on the drawings or directed by the ENGINEER.

B. Permanent erosion control measures shall be implemented as soon as practical after the completion of pipe installation or land disturbance for each segment of the project. In no event shall implementation be postponed when no further activities related to pipe installation would impact that portion or segment of the Project. Partial payment request may be withheld for those portions of the Project not complying with this requirement.

12.3 RIPRAP

A. Unless shown otherwise on the drawings, riprap shall be placed where ordered by the ENGINEER. Carefully compact backfill and place riprap to prevent subsequent settlement and erosion.

B. Preparation of foundations: The ground surface upon which the riprap is to be placed shall be brought in reasonably close conformity to the correct lines and grades before placement is commenced. Where filling of depressions is required, the new material shall be compacted with hand or mechanical tampers.

C. Placement of filter fabric: The surface to receive fabric shall be prepared to a relatively smooth condition free from obstructions, depressions, and debris. The fabric shall be placed with the long dimension running up the slope and shall be placed to provide a minimum number of overlaps. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. The filter fabric shall be anchored in place with securing pins of the type recommended by the fabric manufacturer. Pins shall be placed on or within 3-inches of the centerline of the overlap. The fabric shall be placed so the upstream strip overlaps the downstream strip. The

fabric shall be placed loosely so as to give and therefore avoid stretching and tearing during placement of the stones. The stones shall be dropped no more than three feet during construction. The fabric shall be protected at all times during construction from clogging due to clay, silts, chemicals, or other contaminants. Any contaminated fabric or any fabric damaged during its installation or during placement of riprap shall be removed and replaced with uncontaminated and undamaged fabric at no expense to the OWNER.

D. Placement of riprap: The riprap shall be placed on a 6-inch layer of soil, crushed stone, or sand overlaying the filter fabric. This 6-inch layer shall be placed to maximize the contact between the soil beneath the filter fabric and the filter fabric. Riprap shall be placed with its top elevation conforming to the natural slope of the stream bank and stream bottom. Stone riprap shall be dumped into place to form a uniform surface and to the thickness specified on the drawings. The thickness tolerance for the course shall be – 6-inches and +12 inches. If the Contract Drawings or Bidding Documents do not specify a thickness, the course shall be placed to a thickness of not less than 18 inches.

E. Repair of existing riprap ditches: The Contract Drawings show locations where existing riprap ditches will be disturbed in order to construct the new water main. The CONTRACTOR shall limit the amount of ditch disturbed to that which is necessary to construct the water main. Immediately after placement of the water main, the riprap ditch shall be repaired. The CONTRACTOR, at their option, may reuse the existing riprap providing it is free of all mud or any other deleterious matter and has not been made unusable by the action of the CONTRACTOR. The ENGINEER will determine as to the suitability of the material for reuse. Any shortage of materials to replace the ditch shall be replaced with new material by the CONTRACTOR. If the CONTRACTOR chooses not to use the existing stone, the unused material shall be removed from the site. All new riprap used to repair/replace the existing ditches shall meet the requirements as specified in Article 2.1.D “Riprap” of this Section. Placement of the riprap will be in accordance with the requirements of Article 3.5.D of this Section.

12.4 TEMPORARY BERMS

A. Temporary berm shall be installed using a mound of compacted earth with a minimum allowable height of 18 inches measured from the upslope side of the berm.

B. Side slopes should be 1.5:1 or flatter with a minimum berm base width of 4.5 feet.

C. The channel behind the berm shall have a positive grade to a stabilized outlet. If the channel is less than or equal to 2 percent, the channel shall be stabilized.

D. Temporary berm shall be covered with an erosion control blanket.

12.5 TEMPORARY SLOPE DRAINS

A. Temporary slope drains shall consist of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, flexible rubber, or other materials which can be used as temporary measures to carry water accumulating in the cuts and on the fills down the slopes prior to installation of permanent facilities or growth of adequate ground cover on the slopes.

B. Fiber matting and plastic sheeting shall not be used on slopes steeper than 4:1 except for short distances of 20 feet or less.

C. All temporary slope drains shall be adequately anchored to the slope to prevent disruption by the force of the water flowing in the drains. The base for temporary slope drains shall be compacted and concavely formed to channel the water or hold the slope drain in place. The inlet shall be properly constructed to channel water into the temporary slope drain. Energy dissipaters, sediment basins, or other approved devices shall be constructed at the outlet end of the slope drains to reduce erosion downstream. An ideal dissipater would be dumped rock or a small sediment basin, which would slow the water as well as pick up some sediment. All temporary slope drains shall be removed when no longer necessary.

12.6 SEDIMENT STRUCTURES

A. The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and root mat. To facilitate cleanout the pool area should be cleared.

B. Fill material for the embankment shall be free of roots or other woody vegetation, organic material, large stones, and other objectionable material. The embankment should be compacted in eight-inch layers by traversing with construction equipment.

C. Embankment shall be sloped 2:1 on both sides, and have a height/width according to the following table with a maximum height of 5 feet:

EMBANKMENT DIMENSIONS	
H Ft.	W Ft.
1.5	2.0
2.0	2.0
2.5	2.5

D. Pool volume must not exceed 67 cubic yards/acre.

E. The sediment trap outlet shall be lined with 2 to 3-inches of coarse aggregate with a length in feet of 6 times the draining area in acres.

F. Construction operations shall be carried out in such a manner that erosion and water pollution are minimized.

G. The structure shall be removed, and the area stabilized when the upslope drainage has been stabilized.

H. All cut and fill slopes shall be 2:1 or flatter.

12.7 CHECK DAMS

A. Check dams shall be utilized to retard stream flow or restrict stream flow within the channel. Check dams can be constructed of either stone, logs, or pre-manufactured products as shown on the plans.

B. All check dams shall be keyed into the sides and bottom of the channel. A formal design is not needed for check dams; however, the following criteria should be adhered to when specifying check dams:
   1. The maximum height of the check dam shall not exceed 2 feet. The center of the dam must be at least 6 inches lower than the outer edges.
   2. Stone check dams should be constructed of 2 to 3-inch stone with a 2:1 slope on the downside.
   3. Log check dams should be constructed of 4 to 6-inch logs. The logs should be embedded into the soil at least 18 inches.

12.8 TEMPORARY SILT FENCES

A. Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches or other areas where siltation is a problem.

B. Height of a filter barrier shall be a minimum of 15 inches and shall not exceed 18 inches.

12.9 ENHANCED STONE FILTER RING

A. Stone filter rings shall be placed at the inlet side of proposed or existing storm culverts in order to provide filtering of onsite runoff prior to entering the storm system.

B. Stone filter ring shall be installed in accordance with the TDEC Erosion and Sediment Control Handbook and TDOT Standard Specifications and City of Knoxville Best Management Practices Manual.

END OF SECTION

SECTION 321313
Concrete Paving

PART 1 - GENERAL

21.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

21.1 SUMMARY

A. Section Includes:
   1. Curbs.
   2. Walks.

B. Related Sections:
   1. Division 03 Section “Cast-in-Place Concrete” for general building applications of concrete.
   2. Division 31 Section “Earthwork” for sub-grade preparation, grading, and subbase course.
   3. Division 32 Section “Concrete Paving Joint Sealants” for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

21.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

21.3 ACTION SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Qualification Data: For qualified Installer of detectable warnings, ready-mix concrete manufacturer and testing agency.

D. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

E. Material Test Reports: For each of the following:

1. Aggregates

F. Field quality-control reports.

21.4 QUALITY ASSURANCE

A. Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.

B. Ready-Mix-Concrete 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.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: 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. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

E. ACI Publications: Comply with ACI 301 unless otherwise indicated.

F. Mockups: Cast mockups of full-size sections of each concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.

1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.

2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 10’ by 10’. Include full-size detectable warning.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:

    a. Concrete mixture design.
    b. Quality control of concrete materials and concrete paving construction practices.

2. Require representatives of each entity directly concerned with concrete paving 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 paving subcontractor.
    e. Manufacturer's representative of stamped concrete paving system used for detectable warnings.

21.5 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F and not exceeding 95 deg F.

PART 22 - PRODUCTS

22.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

22.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated fromsteel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

C. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.

G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

H. Plain-Steel Wire: ASTM A 82/A 82M.

I. Deformed-Steel Wire: ASTM A 496/A 496M.

J. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated.

K. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

L. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain-steel bars.

M. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

N. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

P. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

Q. Zinc Repair Material: ASTM A 780.

22.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, Type I, natural gray color.

B. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: Potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

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.

22.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: 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.; Caltexol CIMFILM.
b. BASF Construction Chemicals, LLC; Confilm.
c. ChemMasters; Spray-Film.
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.; VaporAid.
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, Inc.; SikaFilm.
o. SpecChem, LLC; Spec Film.
p. Symons by Dayton Superior; Finishing Aid.
q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
r. Unitex; PRO-FILM.
s. Vexcon Chemicals Inc.; Certi-Vex EnvioAssist.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Anti-Hydro International, Inc.; A-H Curing Compound #2 DR WB.
b. ChemMasters; Safe-Cure Clear.
c. Conspec by Dayton Superior;.
d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
e. Edoco by Dayton Superior;.

f. Euclid Chemical Company (The), an RPM company; Kurez W VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; AQUA KURE - CLEAR.
i. L&M Construction Chemicals, Inc.; L&M CURE R.
j. Meadows, W. R., Inc.; 1100-CLEAR SERIES.
k. Nox-Crete Products Group; Resin Cure E.
l. SpecChem, LLC; PaveCure Rez.
m. Symons by Dayton Superior; Resi-Chem Clear.
n. Tamms Industries, Inc., Euclid Chemical Company (The); TAMMSCURE WB 30C.
o. TK Products, Division of Sierra Corporation;
p. Vexcon Chemicals Inc.; Certi-Vex Enviocure 100.

22.5 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

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

D. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

1. Types IV and V, load bearing for bonding hardened or freshly mixed concrete to hardened concrete.

E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ChemMasters; Exposee.
b. Conspec by Dayton Superior; Delay S.
c. Dayton Superior Corporation; Sure Etch (J-73).
d. Edoco by Dayton Superior; True Etch Surface Retarder.
e. Euclid Chemical Company (The), an RPM company; Surface Retarder Formula S.
f. Kaufman Products, Inc.; Expose.
g. Meadows, W. R., Inc.; TOP-STOP.

h. Metalcrete Industries; Surftard.
i. Nox-Crete Products Group; CRETE-NOX TA.
j. Scofield, L. M. Company; LITHOTEX Top Surface Retarder.
k. Sika Corporation, Inc.; Rugasol-S.
l. SpecChem, LLC; Spec Etch.
m. TK Products, Division of Sierra Corporation; TK-6000 Concrete Surface Retarder.
n. Unitex; TOP-ETCH Surface Retarder.
o. Vexcon Chemicals Inc.; Certi-Vex Envioset.

F. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

22.6 DETECTABLE WARNING MATERIALS

A. Detectable Warning Stamp: Semirigid polyurethane mats with formed underside capable of imprinting detectable warning pattern on plastic concrete; perforated with a vent hole at each dome.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advanced Surfaces Inc.
b. Matcrete Precision Stamped Concrete Tools.
c. Southern Color N.A., Inc.
d. Stampcrete International Ltd.
e. Superior Decorative by Dayton Superior.

2. Size of Stamp: One piece 24 by 48 inches.

B. Liquid Release Agent: Manufacturer's standard, clear, evaporating formulation designed to facilitate release of stamp mats.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Advanced Surfaces Inc.; Liquid Release.
b. Matcrete Precision Stamped Concrete Tools; Liquid Release Agent.
c. Southern Color N.A., Inc.; SCC Clear Liquid Release.
d. Stampcrete International Ltd.; Stampcrete Liquid Release.
e. Superior Decorative by Dayton Superior; Pro Liquid Release.

22.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4500 psi.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
1. Air Content: 5 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements as follows:

1. Pozzolan: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Combined Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with pozzolan not exceeding 25 percent.

G. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.

22.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

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.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. 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.
2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 23 - EXECUTION

23.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

23.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

23.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

23.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

23.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.

3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 15 feet unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

    a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.

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 developing random contraction cracks.

    a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

23.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

L. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to 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 in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

23.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared, and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

23.8 DETECTABLE WARNINGS

A. Stamped Detectable Warnings: Install stamped detectable warnings as part of a continuous concrete paving placement and according to stamp-mat manufacturer's written instructions.

1. Before using stamp mats, verify that the vent holes are unobstructed.
2. Apply liquid release agent to the concrete surface and the stamp mat.
3. Stamping: While initially finished concrete is plastic, accurately align and place stamp mats in sequence. Uniformly load, gently vibrate, and press mats into concrete to produce imprint pattern on concrete surface. Load and tamp mats directly perpendicular to the stamp-mat surface to prevent distortion in shape of domes. Press and tamp until mortar begins to come through all of the vent holes. Gently remove stamp mats.
4. Trimming: After 24 hours, cut off the tips of mortar formed by the vent holes.
5. Remove residual release agent according to manufacturer's written instructions, but no fewer than three days after stamping concrete. High-pressure-wash surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

23.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to 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.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

23.10 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
6. Vertical Alignment of Dowels: 1/4 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

23.11 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: 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 at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

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; 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 it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if 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.

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.

D. 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.

E. 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.

F. Concrete paving will be considered defective if it does not pass tests and inspections.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

H. Prepare test and inspection reports.

23.12 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with Portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 321373
CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.
3. Joint-sealant backer materials.
4. Primers.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1.5 FIELD 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.
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, backing materials, 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.

2.2 COLD-APPLIED AND HOT-APPLIED JOINT SEALANTS

A. Products: All joint sealants products to be in accordance with TDOT specifications and qualified product list.

2.3 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Non-staining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.4 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints 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: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on 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.

3.3 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint 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 joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.
3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact 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.

E. Tooling of Non-sag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements 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 joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. 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 and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.5 PAVING-JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints within concrete paving.

1. Joint Location:

a. Expansion and isolation joints in concrete paving.
b. Contraction joints in concrete paving.
c. Other joints as indicated.

B. Joint-Sealant Application: Joints within concrete paving and between concrete and asphalt paving.

1. Joint Location:
a. Joints between concrete and asphalt paving.
b. Joints between concrete curbs and asphalt paving.
c. Other joints as indicated.

END OF SECTION

SECTION 329200
TURF AND GRASSES

PART 13 - GENERAL

13.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. City of Knoxville Tree Protection Ordinance.

13.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydro-seeding.
3. Turf renovation.
4. Erosion-control material(s).

13.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

13.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed mono-stand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

13.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

13.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Pesticide Applicator: State licensed, commercial.

13.7 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

13.8 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance.

1. Permanent Seeding – between March 15th and May 1st or between August 15th and October 15th.
2. Temporary Winter Seeding – between October 15th and March 15th.
3. Temporary Summer Seeding – between May 1st and August 15th.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 14 - PRODUCTS

14.1 SEED

A. Grass Seed: Seed shall be an improved cultivar blend that is drought tolerant and disease resistant of tall turf type Fescue and heat tolerant Bluegrass; seed shall be sod-quality seed. Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

1. Quality: State-certified seed of grass species as listed below for solar exposure.
2. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
3. See plan notes for Seeding Mixtures.

14.2 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb./1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

14.3 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.

C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.

D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

F. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

G. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

14.4 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 15 - EXECUTION

15.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

15.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydro-seeding and hydro-mulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

15.3 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil.

B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.

1. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

15.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.

C. Fill cells of erosion-control mat with planting soil and compact before planting.

D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

15.5 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h).

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 3 to 4 lb/1000 sq. ft. (1.4 to 1.8 kg/92.9 sq. m)

C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.

F. Protect seeded areas from hot, dry weather or drying winds by applying planting soil within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm) and roll surface smooth.

15.6 HYDRO-SEEDING

A. Hydro-seeding: Mix specified seed, commercial fertilizer and fiber mulch in water, using equipment specifically designed for hydro-seed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre (15.6-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
3. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre (5.2-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydro-mulching) at a rate of 1000 lb/acre (10.4 kg/92.9 sq. m).

15.7 TURF RENOVATION

A. Renovate existing turf where indicated.

B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).

I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.

J. Apply seed and protect with straw mulch as required for new turf.

K. Water newly planted areas and keep moist until new turf is established.

15.8 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.

D. Turf Post-fertilization: Apply commercial fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to turf area.

15.9 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
3. Satisfactory Plugged Turf: At end of maintenance period, the required number of plugs has been established as well-rooted, viable patches of grass, and areas between plugs are free of weeds and other undesirable vegetation.
4. Satisfactory Sprigged Turf: At end of maintenance period, the required number of sprigs has been established as well-rooted, viable plants, and areas between sprigs are free of weeds and other undesirable vegetation.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

15.10 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

15.11 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove non-degradable erosion-control measures after grass establishment period.

15.12 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

1. Seeded Turf: 60 days from date of Substantial Completion.

a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

END OF SECTION

SECTION 331100
WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Standard Specifications for the Knoxville Utilities Board.

1.2 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for water services.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by OWNER or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify OWNER no fewer than 14 days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without OWNER's permission.

1.6 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials necessary to complete the installation of waterlines for the project shall comply with the provisions stated in the Standard Specifications for the Knoxville Utilities Board and the City of Knoxville Building Code.

PART 3 - EXECUTION

3.1 WATERLINE CONSTRUCTION

A. All construction necessary to complete the installation of waterlines for the project shall comply with the provisions stated in the Standard Specifications for the Knoxville Utilities Board and City of Knoxville Building Code.

3.2 FIELD QUALITY CONTROL

B. Inspection and testing necessary to complete the installation of waterlines for the project shall comply with the provisions stated in the Standard Specifications for the Knoxville Utilities Board and City of Knoxville Building Code.

END OF SECTION

SECTION 334100
STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes gravity-flow, non-pressure storm drainage outside the building, with the following components:

1. Pipe and fittings.
2. Cleanouts.
3. Non-pressure transition couplings.
4. Expansion joints.
5. Catch basins.
6. Manhole.
7. Area Drains.
8. Drain Basins.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Catch basins: Include plans, elevations, sections, details, frames, covers, and grates.
2. Manholes: Include plans, elevations, sections, details, frames, covers, and grates.
3. Area Drains: Include plans, elevations, sections, details, frames, covers, and grates.
4. Drain Basins: Include plans, elevations, sections, details, frames, covers, and grates.

C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

D. Field quality-control reports.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle catch basins according to manufacturer's written rigging instructions.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of service.

2. Do not proceed with interruption of service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.

2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.

3. Gaskets: ASTM F 477, elastomeric seals.

2.2 HDPE PIPE AND FITTINGS

A. Corrugated HDPE Drainage Pipe and Fittings 4” to 10”: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Watertight Couplings: Pipe shall be jointed with watertight joints meeting the requirements of AASHTO M252, AASHTO M294, or ASTM F2306. Joints shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacture shall be used on the gasket and bell during assembly.

B. Corrugated HDPE Pipe and Fittings 12” to 60”: AASHTO M294, Type S or ASTM F2306, with smooth waterway for coupling joints.

1. Watertight Couplings: Pipe shall be jointed with watertight joints meeting the requirements of AASHTO M252, AASHTO M294, or ASTM F2306. Joints shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477.

Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacture shall be used on the gasket and bell during assembly. 12” through 60” diameters shall have a reinforced bell with a polymer composite band.

2.3 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.

1. Bell-and-spigot or tongue-and-groove ends and gasketed joints in accordance with AASHTO M-170 or ASTM C-443.

2. Class III, Wall B.

2.4 CATCH BASINS AND AREA DRAINS

A. Standard Precast Concrete Catch Basins:

1. Shall be TDOT approved catch basins as shown on the detail sheet.

B. Standard Precast Concrete Area Drain:

1. Shall be TDOT approved structure as shown on the detail sheet.

C. Standard PVC Drain Basin:

1. Shall be PVC Drain Basin by ADS, Nyoplast or equal.

2.5 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.

2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.

3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.

4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.

5. Riser Sections: 4-inch (102-mm) minimum thickness and lengths to provide depth indicated.

6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.

7. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.

8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.

9. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 36 inches.

10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.

11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Shall be TDOT approved frames and Covers. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER – DRAINS TO RIVER."

2.6 CLEANOUTS

A. Cast-Iron Clean-outs:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

2. Top-Loading Classification(s): Extra Heavy Duty.

3. Sewer Pipe Fitting and Riser to Clean-out: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Plastic Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to clean-out of same material as sewer piping.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

3.3 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use PVC pipe fittings in sewer pipes at branches for cleanouts and PVC pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.

2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.

3. Use Extra-Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches (450 by 450 by 300 mm) deep. Set with tops 1 inch (25 mm) above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.4 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.5 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.6 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.

2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

c. Damage: Crushed, broken, cracked, or otherwise damaged piping.

d. Infiltration: Water leakage into piping.

e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Re-inspect and repeat procedure until results are satisfactory.

3.7 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

B. All Catch Basins, Area Drains, Manholes, Drain Basins, Trench Drains, Water Quality Structures and Storm Pipe shall be cleaned out upon completion of the project when the erosion control measures are removed.

END OF SECTION

Set Up of Modular Housing Units C19009
Solicitation Document A General Information and Cost

General Information about the Supplier	
Sign Your Name to the Right of the Arrow → By signing, you indicate you 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 (Please Print Clearly) →	

Addenda

Addenda are at www.kcdc.org. **Click on "Procurement" and then on "Open Solicitations" to find addenda. Please check for addenda prior to submitting a proposal.**

Acknowledge addenda have been issued by checking below as appropriate:

None ☐	Addendum 1 ☐	Addendum 2 ☐	Addendum 3 ☐	Addendum 4 ☐	Addendum 5 ☐

Statistical Information (Check all the apply)

This business is at least 51% owned and operated by a woman	**Yes ☐ No ☐**
This business qualifies as a small business by the State of Tennessee (Gross receipts of $10,000,000 or less and employing less than 100 full time persons)	**Yes ☐ No ☐**
This business qualifies as a Section 3 business by defined herein	**Yes ☐ No ☐**

This business is owned & operated by persons at least 51% of the following ethnic background:

Asian/Pacific ☐	Black ☐	Hasidic Jew ☐	Hispanic ☐	Native Americans ☐	White ☐

Prompt Payment Discount

A prompt payment discount of _____% is offered for payment within ____ days of submission of an accurate and proper invoice.

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 contender to violations of the Sherman Anti-Trust Act, mail fraud or state criminal violations with an award from the State of Tennessee or any political subdivision thereof have occurred.

General:

7. Supplier fully understands the preparation and contents of the attached offer and of all pertinent circumstances respecting such offer.

8. Such offer is genuine and is not a sham offer.

Iran Divestment Act:

9. Concerning the Iran Divestment Act (TCA 12-12-101 et seq.), by submission of this proposal/quote/quotes, each supplier and each person signing on behalf of any supplier certifies, and in the case of a joint proposal/quote/quotes, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each supplier is not on the list created pursuant to § 12-12-106.

Non-Collusion:

10. Neither the said supplier nor any of its officers, partners, KCDC, agents, representatives, employees or parties interest, including this affiant, has in any way colluded conspired, connived or agreed, directly or indirectly, with any other responder, supplier, or person to submit a collusive or sham offer in connection with the award or agreement for which the attached offer has been submitted or to refrain from making an offer in connection with such award or agreement, or collusion or communication or conference with any other supplier, or, to fix any overhead, profit, or cost element of the offer price or the offer price of any other supplier, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against KCDC or any person interested in the proposed award or agreement.

11. The price or prices quoted in the attached offer are fair, proper and not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the supplier or any of its agents, representatives, KCDC, employees, or parties in interest, including this affiant.

Accuracy of Electronic Copies:

12. If the supplier provides electronic copies of the proposal/proposal/quote to KCDC, the supplier certifies that the information provided on paper and in the electronic format is identical unless specifically noted otherwise.

No Contact/No Advocacy Affidavit

13. After this solicitation is issued, any contact initiated by any supplier or proposer with any owner's representative concerning this proposal is strictly prohibited-except for communication with the Procurement Division. My signature signifies that no unauthorized contact occurred.

14. To ensure the integrity of the review and evaluation process, respondents to this solicitation nor any firm representing them, may not lobby or advocate to owner's staff or Board members. My signature signifies that no unauthorized advocacy occurred.

The undersigned hereby acknowledges receipt of these affidavits and certifies that the submittal in response to this solicitation is in full compliance with the listed requirements.

Signed by	
Printed Name	
Title	
Subscribed and sworn to before me this date	
By (Notary Public)	
My Commission Expires on	
Notary Stamp	

Representations, Certifications, and Other Statements of Bidders

Public and Indian Housing Programs

Table of Contents

1. Certificate of Independent Price Determination

(a) The bidder certifies that--

(1) The prices in this bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to (i) those prices, (ii) the intention to submit a bid, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this bid have not been and will not be knowingly disclosed by the bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a competitive proposal solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the bidder to induce any other concern to submit or not to submit a bid for the purpose of restricting competition.

(b) Each signature on the bid is considered to be a certification by the signatory that the signatory--

(1) Is the person in the bidder's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(l) through (a)(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(l) through (a)(3) above.

_____ *[insert full name of person(s) in the bidder's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the bidder's organization];*

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the bidder deletes or modifies subparagraph (a)2 above, the bidder must furnish with its bid a signed statement setting forth in detail the circumstances of the disclosure.

☒ [Contracting Officer check if following paragraph is applicable]

(d) Non-collusive affidavit. (applicable to contracts for construction and equipment exceeding $50,000) ● in Solicitation Document B attached

(1) Each bidder shall execute, in the form provided by the PHA/IHA, an affidavit to the effect that he/she has not colluded with any other person, firm or corporation in regard to any bid submitted in response to this solicitation. If the successful bidder did not submit the affidavit with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the affidavit by that date may render the bid nonresponsive. No contract award will be made without a properly executed affidavit.

(2) A fully executed "Non-collusive Affidavit" [ ] is, [ ] is not included with the bid.

2. Contingent Fee Representation and Agreement

(a) Definitions. As used in this provision:

"Bona fide employee" means a person, employed by a bidder and subject to the bidder's supervision and control as to time, place, and manner of performance, who neither exerts, nor proposes to exert improper influence to solicit or obtain contracts nor holds out as being able to obtain any contract(s) through improper influence.

"Improper influence" means any influence that induces or tends to induce a PHA/IHA employee or officer to give consideration or to act regarding a PHA/IHA contract on any basis other than the merits of the matter.

(b) The bidder represents and certifies as part of its bid that, except for full-time bona fide employees working solely for the bidder, the bidder:

(1) [ ] has, [ ] has not employed or retained any person or company to solicit or obtain this contract; and

(2) [ ] has, [ ] has not paid or agreed to pay to any person or compan employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

(c) If the answer to either (a)(1) or (a)(2) above is affirmative, the bidder shall make an immediate and full written disclosure to the PHA/IHA Contracting Officer.

(d) Any misrepresentation by the bidder shall give the PHA/IHA the right to (1) terminate the contract; (2) at its discretion, deduct from contract payments the amount of any commission, percentage, brokerage, or other contingent fee; or (3) take other remedy pursuant to the contract.

3. Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions (applicable to contracts exceeding $100,000)

(a) The definitions and prohibitions contained in Section 1352 of title 31, United States Code, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The bidder, by signing its bid, hereby certifies to the best of his or her knowledge and belief as of December 23, 1989 that:

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of a contract resulting from this solicitation;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the bidder shall complete and submit, with its bid, OMB standard form LLL, "Disclosure of Lobbying Activities;" and

(3) He or she will include the language of this certification in all subcontracts at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

(d) Indian tribes (except those chartered by States) and Indian organizations as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) are exempt from the requirements of this provision.

4. Organizational Conflicts of Interest Certification

The bidder certifies that to the best of its knowledge and belief and except as otherwise disclosed, he or she does not have any organizational conflict of interest which is defined as a situation in which the nature of work to be performed under this proposed contract and the bidder's organizational, financial, contractual, or other interests may, without some restriction on future activities:

(a) Result in an unfair competitive advantage to the bidder; or,

(b) Impair the bidder's objectivity in performing the contract work.

[ ] In the absence of any actual or apparent conflict, I hereby certify that to the best of my knowledge and belief, no actual or apparent conflict of interest exists with regard to my possible performance of this procurement.

5. Bidder's Certification of Eligibility

(a) By the submission of this bid, the bidder certifies that to the best of its knowledge and belief, neither it, nor any person or firm which has an interest in the bidder's firm, nor any of the bidder's subcontractors, is ineligible to:

(1) Be awarded contracts by any agency of the United States Government, HUD, or the State in which this contract is to be performed; or,

(2) Participate in HUD programs pursuant to 24 CFR Part 24.

(b) The certification in paragraph (a) above is a material representation of fact upon which reliance was placed when making award. If it is later determined that the bidder knowingly rendered an erroneous certification, the contract may be terminated for default, and the bidder may be debarred or suspended from participation in HUD programs and other Federal contract programs.

6. Minimum Bid Acceptance Period

(a) "Acceptance period," as used in this provision, means the number of calendar days available to the PHA/IHA for awarding a contract from the date specified in this solicitation for receipt of bids.

(b) This provision supersedes any language pertaining to the acceptance period that may appear elsewhere in this solicitation.

(c) The PHA/IHA requires a minimum acceptance period of 90 calendar days.

(d) In the space provided immediately below, bidders may specify a longer acceptance period than the PHA's/IHA's minimum requirement. The bidder allows the following acceptance period: calendar days.

(e) A bid allowing less than the PHA's/IHA's minimum acceptance period will be rejected.

(f) The bidder agrees to execute all that it has undertaken to do, in compliance with its bid, if that bid is accepted in writing within (1) the acceptance period stated in paragraph (c) above or (2) any longer acceptance period stated in paragraph (d) above.

7. Small, Minority, Women-Owned Business Concern Representation

The bidder represents and certifies as part of its bid/ offer that it --

(a) [ ] is, [ ] is not a small business concern. "Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding, and qualified as a small business under the criteria and size standards in 13 CFR 121.

(b) [ ] is, [ ] is not a women-owned business enterprise. "Women-owned business enterprise," as used in this provision, means a business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business.

(c) [ ] is, [ ] is not a minority business enterprise. "Minority business enterprise," as used in this provision, means a business which is at least 51 percent owned or controlled by one or more minority group members or, in the case of a publicly owned business, at least 51 percent of its voting stock is owned by one or more minority group members, and whose management and daily operations are controlled by one or more such individuals. For the purpose of this definition, minority group members are:

(Check the block applicable to you)

[ ] Black Americans	[ ] Asian Pacific Americans
[ ] Hispanic Americans	[ ] Asian Indian Americans
[ ] Native Americans	[ ] Hasidic Jewish Americans

9. Certification of Eligibility Under the Davis-Bacon Act (applicable to construction contracts exceeding $2,000)

(a) By the submission of this bid, the bidder certifies that neither it nor any person or firm who has an interest in the bidder's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of the contract resulting from this solicitation shall be subcontracted to any person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

10. Certification of Nonsegregated Facilities (applicable to contracts exceeding $10,000)

(a) The bidder's attention is called to the clause entitled **Equal Employment Opportunity** of the General Conditions of the Contract for Construction.

(b) "Segregated facilities," as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

(c) By the submission of this bid, the bidder certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The bidder agrees that a breach of this certification is a violation of the Equal Employment Opportunity clause in the contract.

(d) The bidder further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) prior to entering into subcontracts which exceed $10,000 and are not exempt from the requirements of the Equal Employment Opportunity clause, it will:

(1) Obtain identical certifications from the proposed subcontractors;

(2) Retain the certifications in its files; and

(3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

Notice to Prospective Subcontractors of Requirement for Certifications of Nonsegregated Facilities

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Employment Opportunity clause of the prime contract. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

Note: The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

11. Clean Air and Water Certification (applicable to contracts exceeding $100,000)

The bidder certifies that:

(a) Any facility to be used in the performance of this contract [ ] is, [ ] is not listed on the Environmental Protection Agency List of Violating Facilities:

(b) The bidder will immediately notify the PHA/IHA Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the bidder proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and,

(c) The bidder will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

12. Bidder's Signature

The bidder hereby certifies that the information contained in these certifications and representations is accurate, complete, and current.

(Signature and Date) _____

(Typed or Printed Name) _____

(Title) _____

(Company Name) _____

(Company Address)

Previous edition is obsolete

form **HUD-5369-A** (11/92)

Set Up of Modular Housing Units C19009
Solicitation Document D Business Description and Summary of Skills and Qualifications

Using no more than two pieces of paper, provide the following information:

- A statement explaining your interest in the project
- An overview of the proposed project team
- An explanation of why the team is best qualified for the work
- A narrative history including the date of inception or incorporation
- A narrative description of the supplier and its service offerings
- Description of staff size
- Identify the key individuals and their proposed roles
- A statement of the years of experience for each proposed employee
- Any current certifications applicable to the professional services the employee will provide

Set Up of Modular Housing Units C19009
Solicitation Document E Previous Experience/References

Suppliers will provide information about their experience to show proven and demonstrated ability to execute the RFP requirements.

- The proposal must include at least three specific references of similar accounts.
  While you may have had numerous separate contracts with a particular company, a company can only be one reference. Present information in this format:

    - Name of the business serviced
    - Contact name
    - Phone number
    - Email address
    - Amount of the contract
    - Description of the contract
    - Date the contract began and ended

- Number of similar projects completed by the supplier

Set Up of Modular Housing Units C19009
Solicitation Document F Action Plan and Timeline

Using no more than two pieces of paper:

- Explain how you will complete this project by the timeline specified in this document
- Describe how you successfully balanced the competing demands of multiple clients in the past

Set Up of Modular Housing Units C19009
Solicitation Document G Cost

Set Up is guaranteed within 100 days after contract.	
Component Pricing Portions of the Total Price Include:	
Set up of 25, 1 Bedroom Duplex	**$**
Set Up of 3, 2 Bedroom House	**$**
28 Foundations	**$**
Sidewalks/Curbing	**$**
Finish of blacktop/striping	**$**
Finish Grading/Seeding	**$**
Allowance for landscaping	**$30,000**
Other:	
Other:	

Part One: Statement of Insurance Requirements

1. 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- :VIII or better. Upon award, the Contractor shall provide Certificate(s) of Insurance and amendatory endorsements to Owner evidencing said insurance coverages.

The Contractor agrees the insurance requirements herein as well as Owner'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. Owner's failure to require a certificate of insurance, acceptance of a non-conforming certificate, or allowing the Contractor to commence work shall not operate as a waiver of these minimum insurance requirements or the liabilities and obligations assumed by the Contractor under this contract.

a. Commercial General Liability and Umbrella/Excess Liability Insurance: occurrence version commercial general liability insurance with a limit of not less than $1,000,000 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 $2,000,000.

Such insurance shall contain or be endorsed to contain a provision that includes Owner and Owner Entity as additional insureds with respect to ongoing and completed operations providing coverage at least as broad as CG 20 10 07 04 and 20 37 07 04 endorsements. The coverage shall contain no special limitations on the scope of its protection afforded to the listed insureds.

See paragraph "f.1." for exact identification of certificate holder and additional insureds.

b. Commercial Automobile Liability Insurance: in an amount not less than $1,000,000 (combined single limit) for all owned, hired, and non-owned vehicles utilized by contactor in connection with the Project. Coverage is to include coverage for loading and unloading hazards.

Such insurance shall contain or be endorsed to contain a provision that includes Owner and Owner Entity as additional insureds.

See paragraph "f.1." for exact identification of certificate holder and additional insureds.

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:** coverage, providing defense and indemnity coverage for bodily injury, property damage, and environmental investigation and clean-up costs for pollution conditions arising from the Contractor's operations. Limit of liability not less than $1,000,000 each occurrence and $2,000,000 annual aggregate. The policy shall include a minimum three (3) year Discovery (tail) reporting period, and a Retroactive Date that equals or precedes the effective date of this contract or the performance of work hereunder. Coverage may be provided on a per project basis.

e. **Builder's Risk:** coverage shall be written on an All-Risk, Replacement Cost, and Completed Value Form basis in an amount at least equal to $3,000,000, as well as subsequent modifications of that sum due to Change Order(s). Contractor agrees to be responsible for reporting increases in the projected completed value of the work due to Change Order(s).

Coverage shall insure *without limitation* against the perils of fire (with extended coverage) and physical loss or damage including, but not limited to and without duplication of coverage, theft, vandalism, malicious mischief, collapse, windstorm, testing and startup, temporary buildings, portions of the work stored off site, all portions of the work in transit, debris removal including demolition occasioned by enforcement of any applicable legal requirements and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

Coverage shall insure without limitation slab on grade, excavations, foundations, caissons, tenant finish work, and retainage walls around the perimeter of the project. Any exclusion of so-called underground damage to pipes, collapse of structure, or damage resulting from explosion or blasting shall be deleted.

Insurance is to cover all property of Contractor (and its subcontractors), Owner and Owner Entity as their interest may appear.

Coverage shall include soft costs resulting from damage or destruction to insured property on-site and while in transit including flood, earthquake and earth movement when such perils are required. Such insurance shall cover continuing expenses not directly involved in the direct cost of construction/renovation, including expense incurred upon money borrowed to finance construction or repair, continuing interest on mortgage loans, advertising, promotion, realty taxes and other assessments, the cost to the insured of additional commissions incurred upon re-negotiating leases, and other expenses incurred as a result of property loss or destruction by an insured peril.

See paragraph "f.1." for exact identification of certificate holder and additional insureds.

f. **Other Insurance Requirements:**

1. Upon award, Contractor shall furnish Owner with original Certificate(s) of Insurance and amendatory endorsements effecting coverage required by this section.

The certificate holder shall be:
Knoxville's Community Development Corporation (KCDC)
901 N Broadway
Knoxville, TN 37917

The additional insureds shall be:

Owner
Knoxville's Housing Development Corporation (KHDC), its officials, officers, employees, and volunteers
901 N Broadway
Knoxville, TN 37917

Owner Entity
Knoxville's Community Development Corporation (KCDC), its officials, officers, employees, and volunteers
901 N Broadway
Knoxville, TN 37917

2. 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.

3. A minimum 30-day cancellation notice for all insurances (by endorsement if necessary) is required.

4. Provide certified copies of endorsements and policies if requested by Owner in lieu of or in addition to Certificates of Insurance.

5. Replace certificates, policies, and endorsements for any such insurance expiring prior to completion of services.

6. Maintain such insurance from the time services commence until services are completed or through such extended discovery/reporting/tail period as required. Failure to maintain or renew coverage or to provide evidence of renewal may be treated by Owner as a material breach of contract.

7. Any deductibles and/or self-insured retentions greater than $50,000 must be disclosed to and approved by Owner prior to the commencement of services. Use of large deductibles and/or self-insured retentions will require proof of financial ability as determined by Owner.

8. All policies must be written on an occurrence basis.

9. 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.

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

g. **Right to Revise or Reject:** Owner 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.

h. No Representation of Coverage Adequacy: The coverages, limits or endorsements required herein protect the primary interests of Owner and Owner Entity, 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

Part Two: Term Sheet - Insurance Requirements

Term Sheet - Insurance Requirements

Set Up of Modular Housing Units C19009

Owner: Knoxville's Housing Development Corporation (KHDC) **Owner Entity: Knoxville's Community Development Corporation (KCDC)**	
Certificate Holder	Knoxville's Community Development Corporation 901 N Broadway Knoxville, TN 37917
Additional Insureds	Knoxville's Housing Development Corporation (KHDC), its officials, officers, employees, and volunteers 901 N Broadway Knoxville, TN 37917 Knoxville's Community Development Corporation (KCDC), its officials, officers, employees, and volunteers 901 N Broadway Knoxville, TN 37917
GL *(Contractor & Subcontractors)*	$1M / $2M
Auto *(Contractor & Subcontractors)*	$1M (owned, hired, & non-owned)
WC & Employers Liability *(Contractor & Subcontractors)*	Statutory limits
Pollution *(Contractor)*	$1M / $2M with 3 year Discovery; with Retro Date at least equal to contract date
Builder's Risk *(Contractor)*	$3,000,000
Primary non-contributory *(Contractor & Subcontractors)*	Required – must indicate on COI
Waiver of Subrogation *(Contractor & Subcontractors)*	Required – must indicate on COI

Clayton Building Solutions
5000 Clayton Road
Maryville, TN 37804

Project: KHDC Modular C19008
Knoxville, TN
Date: 2-5-19

Permits, Approvals, Procedures	KHDC	CMH	GC/Assembly Contractor	Comments
KHDC will obtain Plan approval. Contractor will pull all Permits for Building Construction, Electrical, Plumbing, Mechanical, Signage, etc. from local Building / Codes enforcement department.	x		x	
Obtain all Permits for all Utility Services (Water, Sewer, Sprinkler supply, Electric, Gas, etc.)	x			
Costs associated with any and all Tap Fees including but not limited to Water, Sewer, Sprinkler supply, Electric, Gas, etc.	x			
Obtain Third Party Insignias issued by the Third Party Review / Inspection agency for the modules only.		x		
Obtain State Insignias issued by the State Modular Regulatory agency.		x		
Obtain Transportation Permits to deliver Modular Units from the CMH manufacturing facility to the Project Site or a designated storage area.		x		
Provide Builders Risk Insurance on Modular units once delivered to Project job site.			x	
Project Managers from KCDC, CMH and Chosen Assembler to develop timelines for project from start to finish establishing benchmarks and control lines.	x	x	x	
Transportation / Unit Storage / Temporary Facilities	**KHDC**	**CMH**	**GC/Assembly Contractor**	**Comments**
Inspect route to job site (and between staging area and job site if staging area required) to insure units can be delivered to site. Road width 20' min. / Overhead clearance 16' min. and turning radius must be long enough and wide enough to accommodate units.		x		Transportation company
Provide truck, driver, and escort's to deliver Modular Units from manufacturing facility to job site or staging area.		x		Transportation company
Provide adequate storage on the job site or off-site storage area to accommodate the modular units of the total project at rate of 3 buildings per day, or 6 modules per day. The tight laydown area requires us to review this to make the traffic flow work for the team.	x	X	x	Review on paper for set process, traffic management process.
Provide security for units while in storage from theft and vandalism. GC is responsible for the repair and replacement of any modular units, including contents and components, during storage or on job site.			X	

Divison - 2 Site Construction				
Unit Erection / Set Up	**KHDC**	**CMH**	**GC/Assembly Contractor**	**Comments**
Provide all equipment and machinery required to set and erect modules on the foundation including crane, rigging, lifts, scaffolding, generators, air compressors, pneumatic tools and common fasteners, safety rigging and equipment, hand tools, ladders, etc. CMH to provide specialty fasteners.			X	
Observe all OSHA required safety measures while working including record keeping, reporting, etc.		X	X	
Remove all plastic, furring strips, nails, staples, strapping, etc. from units prior to removal from carriers onto foundation and place in dumpster.			X	
Evaluate the units based on floor plan configuration, and ship loose - then properly place lifting cables to lift unit evenly based on weight using spaced pick points.			X	
Place lifting cables on units and hook to lifting bars provided by crane company in a manner that will not damage windows, doors, siding, overhangs, shingles, etc.			X	
Place units on foundation using marks laid out beforehand. Units are to be properly aligned so the proper finish of the modules can be made by each subcontractor. Any alignment problems to be brought to the attention of the CMH Project Manager and the GC's Project Manager to determine a satisfactory resolution in writing.			X	
Stack all empty carriers in stacks of 4 high for transport back to the manufacturing facility.			X	
Each module is to be walked at the end of each day by the Set Crew Supervisor and the CMH Project Manager. Any damage incurred from the set is to be noted by use of a punch list. The modules set on the foundation are to be protected from water damage at the conclusion of each work day by the set crew including windows, doors, and any materials left unprotected. The set crew will be responsible for the repair of any damage either from the set process or water during the set. Exhibit "G" will be used for this tracking at the various inspection points. Set contractor is to provide necessary tarps, tapes, etc.		X	X	
Make sure all windows and doors are closed and secured at the end of the work day and during any weather event during the work day. Once units are set, the GC is responsible for this activity due to the requirements on security.			X	
Properly install, lap, tape, and fasten the house wrap material on the building so as to provide a complete house wrap envelope on the entire building. Includes making repairs to torn or damage house wrap during set or transportation process...			X	
Assembly contractor is responsible for removing any protective shipping wrap, temporary shipping walls etc.; is responsible for providing adequate trash dumpsters.			X	
Assembly contractor is responsible for setting of the units and assuring the units are secured to the foundation and units are interconnected per the engineering design details and CMH structural connection details. All connectors (plates, straps, hangers etc.) provided by CMH. CMH will supply any specialty bolts/lags to complete the assembly. Assembly contractor is responsible for providing all nail gun fasteners and standard screws (nails, framing fasteners, drywall screws, etc.) Assembly contractor is responsible for leveling of the floors, ceilings and marriage walls for correct alignment.		X	X	
Divison - 3 and 4 Foundation	**KHDC**	**CMH**	**GC/Assembly Contractor**	**Comments**
Provide a completed and cured foundation system (footers, walls, piers, support columns, drain tiles, etc.) time TBD prior to commencement of set of units.			X	
Measure the foundation to ensure it reflects dimension shown on plans in length, width, diagonal square-ness, and levelness prior to setting a modular unit on the foundation. Verification to be documented by Set Crew supervisor, CMH and GC Project Managers. This is doen as an overlay first, before construction. We then confirm with the real construction.		X	X	
A 2x treated sill plate shall be installed and fastened to foundation by GC Structural Engineers design specifications prior to commencement of set. Sill plate anchors should not be installed in a manner that would have them located under a rim band or floor joist on the modular unit. (Another way to avoid joists is to use a double sill plate)			X	
All foundation work to be per current codes, and approved plans including but not limited to materials, soil treatment for termites, ventilation of humidity and gases, drainage, etc..			X	

Site grading should be in a manner that proper drainage is achieved to prevent water from collecting around or inside foundation walls and footers. Interior of foundations to be kept dry to provide acceptable working conditions for CMH subcontractors and prevent an environment that promotes mold and mildew growth. Accumulating water should be kept pumped from foundation interior at all times.			x	
Divison - 5 Metals	**KHDC**	**CMH**	**GC/Assembly Contractor**	**Comments**
Exterior stairs or handrails system supplied and installed by contractor (only applicable to non-handicapped entrance to three houses).			X	
Divison - 6 Woods	**KHDC**	**CMH**	**GC/Assembly Contractor**	
Install all exterior lagging/bolting at foundation sill plates and piers. Materials supplied by CMH			X	
Repair trim that may have pulled or gapped at joints during shipment.			X	
Complete interior trim with required paint / caulk. CMH to provide a definined amount.			X	
Install base molding once flooring is installed. CMH to provide molding and caulk.			X	
Install all ship loose trim - caulk, fill, paint if required.			X	
Install fire partition in attic of duplex units.			X	
Finish front entry porch as required.			X	
Install gabled porch on side entrance of duplex (page 23, 26, 27 of approval set). All Materials and Labor by contractor at the site (except the siding material for the gable, to be provided to match duplex by Clayton). Shingle is Certanteed Landmark Weathered Wood			X	
Raise hinged roof and install peak. Fasteners supplied by assembly contractor.			X	

Divison - 7 Thermal and Moisture	KHDC	CMH	GC/Assembly Contractor	
Use an approved flashing detail at any area where the home would be set at or below grade.			X	
Install R30 batten insulation in the floor cavity. CMH to supply insulation. Installer to supply supports or other method of securement			X	
Properly install, lap, tape, and fasten the house wrap material on the building so as to provide a complete house wrap envelope on the entire building. Includes making repairs to torn or damage House Wrap during set or transportation processes. CMH to provide materials.			X	
Install all cementious lap at gable ends of homes. Also to finish installing lap at foundation (typically 1 course). Clayton to supply materials except for fasteners.			X	
Finishing installing shingles (typically 2-3 courses on each side), ridge vent and cap shingles. Clayton to supply materials except for fasteners.			X	
Install siding and shingle porch at side entrance of duplex. All Materials and Labor by contractor at the site (except the siding material for the gable, to be provided to match duplex by Clayton). Shingle is Certanteed Landmark Weathered Wood			X	
Divison - 8 Openings	**KHDC**	**CMH**	**GC/Assembly Contractor**	
Adjust interior/exterior doors for level and plumb if required.			X	
Adjust windows for proper opening if needed.			X	
Install any interior door and locksets on mateline walls. Prehung door assembly provided and shipped loose in modules by CMH. (2-section unit only)			X	
Final keying. Door/Key schedule required.	X	X		
Division 9 - Finishes	**KHDC**	**CMH**	**GC/Assembly Contractor**	
Complete mate line openings within living units to Level 4 finish quality. Include paint - Paint provided by CMH. (Only required on 2-section home)			X	
Install gypsum on ceiling at mating area to Level 4 finish quality. Include paint. Paint provided by CMH. (Only required on 2-section home)			X	
Repair gypsum stress cracks including materials and labor. Repair will be adequately finished to Level 4. Touch-up paint provided by CMH			X	
Install flooring (Vinyl plank) throughout home. Clayton to supply flooring materal. Adhesives, underlayment and any other sundry supplies are supplied by contractor.			X	
Division 10 - Specialties	**KHDC**	**CMH**	**GC/Assembly Contractor**	
Install house numbers on all units, including labor and materials	X			
Check for loose towel bars and TP holders. Tighten if necessary			X	
Division 11 - Equipment	**KHDC**	**CMH**	**GC/Assembly Contractor**	
Equipment check on appliances and Commissioning executed when full power is connected to house.			X	
Free standing appliances are shipped in place with original packing carton from the supplier taped to front of appliance. Any damage is to be noted at inspection of units upon delivery. Remove shipping straps during final punch out. Plug in electric appliances.			X	
Check ice maker valve to verify hose connection hasn't vibrated loose in shipment.			X	
Division 12 - Furnishings	**KHDC**	**CMH**	**GC/Assembly Contractor**	
Adjust cabinet doors as needed			X	

Division 15 - Plumbing				
DWV - All first floor DWV by CMH manufacturing facility installed as a "stubbed through the sub floor" installation only. Assembly company to make all crawl space connections and tie all stubbed points floors to a single point. Final connection to street sewer tap is responsibility of GC. Installation includes all labor. Materials for crawl space connections will be supplied by Clayton. Any materials needed for final connection are supplied by GC.			X	
Supply - All supply trees by CMH are installed in the manufacturing facility. 2 bedroom model will have connections that need to be made in the crawl space; this crossove installation is the assembly companies scope. Final connection to street meter tap provided is responsibility of the GC. Materials for crossover connections will be supplied by Clayton. Any materials needed for final connection are supplied by GC.			X	
Clayton to provide all plumbing fixtures, already set in place and connected, for the home.		X		
Water heater overflow pan is stubbed into the crawl space. This will need to be ran outside the crawl space per code. Any labor and materials needed are by contractor at the site.			X	
Check and tighten all shut off valves and P-Trap connections. These sometimes will loosen from vibrations caused during transportation.			X	
On site plumbing completion / installation to include all design, labor and materials to provide pressure reducing valves, backflow preventers, booster pumps, storage tanks, etc.			X	
Flush and test all supply plumbing. Units are tested at plant prior to shipment but should be retested on site after all work is completed and before building is left unattended while water is on. Remove all aerators prior to flushing system. Reinstall aerators after lines are flushed. Supply lines should be pressure tested.			X	
Once drain plumbing is connected test units per City of Knoxville standards.			X	
Division 15 - HVAC	KHDC	CMH	GC/Assembly Contractor	
Trane air handler supplied and installed by Clayton		X		
Trane heat pump unit is supplied by CMH. Installation, line sets, pads, etc. at supplied by contractor at the site. Clayton will have a 30A disconnect installed in an agreed on location.			X	
Supply and Install remaining ductwork in the floor system. CMH will have boots and registers and flex branches installed in the home. Main trunk line will need to be furnished and installed at the site. Connections from the branch lines to the main duct are by contractor at the site. Collars, tapes, mastics, etc. are supplied by site contractor.			X	
Install return air system			X	
Complete dryer duct installation. Hose will have to be taken to foundation wall and through (only on the one house on Chillicothe)			X	

Division 16 - Electrical	KHDC	CMH	GC/Assembly Contractor	
Electrical crossovers - The plant will run any circuits that go to opposite module to a junction box and/or snap connectors. Field connections in the junction boxes are to be done at the site by set contractor. (only on 2-section home)			X	
Meter base and weatherhead system to be supplied and installed at the site by contractor.			X	
Connection of the service entrance cable is required. CMH to provide conduit to the panelboard. Wire and labor to accomplish this will be supplied by contractor.			X	
CMH to provide boxes and ENT conduit for CATV and Phone cables per requirements. Conduits to run from each location through the crawlspace to an approved termination point. Phone junction boxes, cable/satellite junction boxes, etc. are supplied and installed by contractor.			X	
CMH to provide and install all switches, receptacles, permanently attached lights, bulbs, etc. on the home.		X		
GC to provide and install all switches, receptacles, lights, or other electrical fixtures outside the building envelope including all materials and labor. This includes site build portions of the building, all exterior and security lighting.			X	
Electrical system is tested at plant prior to shipment but should be functionally tested on site after all work is completed and before building is left unattended. Final testing to be completed by GC once power is connected to house.			X	

Solicitation Document F Envelope Coversheet for Set Up of Modular Housing Units C19009

State Law requires certain supplier license information on the front of your envelope. You are responsible for providing the correct information on the envelope front but KCDC provided this form as a guide to help you. Failure to supply this information may invalidate your proposal. **Attach this completed page to the front of your proposal envelope**

Due Date/Time		03-15-19 at 2:00 p.m.	
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 License**	
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 License**	
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 License**	
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**	

Advisements:

1. KCDC will not consider notes changing the proposal written on the proposal envelope.
2. For the listed subcontractor types above, you may only list one firm.
3. State requirement information is at **https://www.tn.gov/commerce/regboards/contractors.html**