

***Construction Specifications
For
Dupont Soccer Complex
at North Access Road
For
City of Chattanooga Parks, Recreation,
Arts and Culture Department
City of Chattanooga, Tennessee***

***Prepared By:
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March Adams Project No.: 02279

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Invitation to Bid

Name of Project: **Dupont Soccer Complex at North Access Road**

Owner: City of Chattanooga Parks, Recreation,
Arts and Culture Department
City Hall 2nd Floor
216 East 11th Street
Chattanooga, TN 37404

SEPARATE sealed BIDS for construction of a four new 240' x 360' Soccer fields (Field 1-4), construction of a new entrance driveway and parking areas are required. General improvements include clearing, grubbing, sinkhole repair, grading, storm drainage, paved driveway and parking lots, sanitary sewer grinder pump station and force main, field irrigation, irrigation intake pump station and force main, potable water service line, sediment and erosion control best management practices, soccer field equipment, and field lighting. All construction mentioned above including additional construction as shown on the construction drawing and specifications shall include the furnishing of all labor material, equipment, tools, supervision, incidental, and any other items necessary or convenient to complete the construction of the project.

A non-mandatory pre-bid meeting will be held at March Adams & Associates, Inc., 610 Dodds Avenue, Chattanooga, TN., 37404 on 21th of July 2003, at 10:00 am EST.

SEPARATE sealed bids will be received by the Purchasing Department of the City of Chattanooga, 212 East Tenth Street, Chattanooga, TN, 37402 until 2:00 pm local time on the 4th of August 2003 EST. and then at said place publicly opened and read aloud.

No bids will be received or accepted after the above specified time for the opening of Bids. Bids submitted after the designated hour will be deemed invalid and returned unopened to the bidder.

The BIDDING DOCUMENTS may be examined at the following location(s):

Associated General Contractors
101 W. 21st Street
Chattanooga, TN 37408

Chattanooga Builder's Exchange
2100 S. Greenwood Avenue
Chattanooga, TN 37404

F.W. McGraw Hill Dodge
5708 Uptain Road, 5800 Building, Ste 900
Chattanooga, TN 37411

March Adams & Associates
310 Dodds Avenue
Chattanooga, TN 37404

Copies of BIDDING DOCUMENTS may be obtained at the office of the Engineer, March Adams & Associates, upon payment of \$100.00 for each set (check payable to City of Chattanooga). The \$100.00 deposit is refundable upon return of un-marked plans and specifications.

All bidders must be licensed contractors as required by the Contractor's Licensing Act of 1976 of the General Assembly of the State of Tennessee and all acts amendatory thereof, and must provide evidence of license in the appropriate classification before such bid will be considered.

The Contractor shall comply with all State, Federal, and Local laws and/or regulations.

The Owner reserves the right to waive any irregularities or reject any or all bids.

INSTRUCTIONS TO BIDDERS

1. BIDDING DOCUMENTS

Complete sets of Bidding Documents, obtained from the issuing office designated in the Invitation to Bid, shall be used in preparing bids. Neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

2.1 Before submitting a Bid, each Bidder must (a) examine and fully understand the scope of work, the Contract Documents, and all requirements thereof, (b) visit the site to familiarize himself with local conditions that may in any manner affect cost, progress or performance of the work, (c) familiarize himself with federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the work; and (d) study and carefully correlate Bidder's observations with the Contract Documents. Failure to do so will not relieve a successful bidder of his/her obligation to carry out the provisions of this contract.

2.2 Any reports of investigations and tests of subsurface and latent physical conditions at the site, or of items which otherwise may affect the cost, progress, or performance of the work, and which have been relied upon by Engineer in preparing the Contract Documents, shall be made available to any Bidder requesting them. These reports are not guaranteed as to accuracy or completeness, nor are they part of the Contract Documents. Before submitting his Bid, each Bidder will, at his own expense, make such additional investigations and tests, as the Bidder may deem necessary, to thoroughly familiarize himself with the physical and subsurface conditions at the site, and to determine his Bid for performance of the work to be in accordance with the time, price and other terms and conditions of the Contract Documents.

2.3 On request, Owner will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of his Bid.

3. BID SECURITY

Each bid must be accompanied by bid security made payable to City of Chattanooga, TN, in an amount of **five percent (5%)** of the Bidder's maximum bid price, and in the form of a bid bond issued by a Surety Company authorized to transact business in the State of Tennessee.

The bid security of the successful bidder will be retained until such bidder has executed the contract agreement and furnished the required contract bonds, whereupon it will be returned. If the successful bidder fails to execute and deliver the contract agreement and furnish the required contract bonds within 15 days of the Notice of Award, Owner may annul the Notice of Award and the bid security of that bidder will be forfeited. Bid security of other bidders will be returned within 15 days of final action of City of Chattanooga on this project.

In the event that final action by the City of Chattanooga has not been completed within 60 days of the date of public bid opening, any or all bids may be withdrawn and the bid security will be returned.

4. BID SUBMISSION

4.1 Each bid must be submitted on the Bid Forms that are bound in the Contract Documents. Bid forms must be completed in ink or by typewriter. The unit bid price of each item on the form must be stated. In case of discrepancies, the extension of the quantities and unit price will govern. Quantities are not guaranteed. Final payment will be made on actual quantities. Each bid must contain a fully completed Statement of Qualifications and Statement of Equipment, the forms of which are bound in the Contract Documents.

4.2 Each bid must contain a fully executed Drug-Free Workplace Affidavit, the form of which are bound in the Contract Documents.

4.3 Bids shall contain an acknowledgment of receipt of all Addenda.

4.5 Bids shall be submitted at the time and place indicated in the Invitation to Bid and shall be in compliance with the T.C.A. 62-6-102 through 62-6-119. Bidders must have a current State Contractors License at the time of the bid opening and must produce copy of same. After the opening of the bids, the apparent successful bidder will be required to provide evidence of license in the appropriate classification before such bid will be considered for award. Bids shall be submitted in a sealed envelope clearly marked as follows:

Project Title

Bidder's Name and Address

Bidder's Tennessee Contractor's License Number

Bidder's License expiration date

Bidder's License Category of Classification

All envelopes containing bids that are not marked as described above will be declared non-responsive, will not be opened, and will be returned to the Bidder unopened. The Contractor's Identification Form at the end of this Section shall be used for this purpose and affixed to the outside of the envelope. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified on the Bid Form.

4.6 Bids must be accompanied by the Bid Security.

4.7 Bids may be modified or withdrawn by a written request delivered to the place where bids are to be submitted at any time prior to the opening of Bids.

5. AWARD OF CONTRACT

5.1 Owner reserves the right to reject any and all bids, to waive any and all irregularities and to negotiate contract terms with the successful bidder, and the right to disregard all nonconforming, non-responsive, or conditional bids.

5.2 The owner reserves the right to award this Contract to the bidder that best responds to the Invitation to Bid by submitting the “lowest and best” bid. ***For the purposes of this Contract, the lowest and best bid shall be determined by not only the dollar amount of the Bidder’s response, but such other related matters which may include, but not be limited to the Bidder’s prior experience in projects of this nature.*** In evaluating bids, Owner shall consider the qualifications of the bidders, whether or not the bids comply with the prescribed requirements, and alternates and unit prices if requested in the bid form. Owner may conduct such investigations as he deems necessary to assist in the evaluation of any bid. The Owner reserves the right to reject any bid if the investigation of such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the Contract.

5.3 The Owner requests all bidders to submit a list of all subcontractors, other persons or organizations proposed for portions of the work within 24 hours of the Bid Opening, and will consider the qualifications of such in the evaluation of any bid.

5.4 If the contract is to be awarded, Owner will give the successful bidder a Notice of Award within 15 days after final action of the City Chattanooga on this project.

5.5 In determining the suitability and acceptability of proposed bidders, the City reserves the right to consider each bidder's commitment to hire minorities and/or subcontract with minority contractors, relative to certain phases of the contracted services. The contractor to be awarded this project must commit that neither it nor any of its subcontractors will discriminate on the basis of race, color, national origin, age, physical disability, or sex in the performance of this contract. The contractor shall carry out applicable government regulations in the award and administration of all governmentally assisted contracts. Failure by the contractor to carry out these requirements shall be a material breach of this contract, which may result in the termination of this contract or such other remedies as the County may deem appropriate.

6. CONTRACT SECURITY

The successful bidder shall furnish Performance and Payment Bonds at the time of delivery of the executed agreement to Owner. Each bond shall be in an amount at least equal to one hundred percent (100%) of the total contract price, guaranteeing the faithful performance and payment of all Contractor's obligations under the contract documents. These bonds shall remain in effect at least until one year after the date of final payment. All bonds shall be executed by surety companies licensed to do business in the State of Tennessee.

7. AGREEMENT

The successful bidder will be required to execute the contract on the form of Agreement, to execute three sets of the Contract Drawings and to deliver all executed counterparts with all other Contract Documents to Owner within fifteen days after receipt of the Notice of Award.

8. ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the specifications or other pre-bid documents will be made to any bidder orally. Every request for such interpretation should be in writing addressed to the March Adams & Associates, 310 Dodds Avenue, Chattanooga, TN 37404. To be given consideration, the request must be received at least five days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be faxed, with telephone verification, to all prospective bidders no later than three days prior to the date fixed for the opening of bids. It will also be mailed at the request of the bidder. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his/her bid as submitted. All addenda so issued shall become part of the contract documents.

9. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

The project herein described is to be completed within 150 calendar days from the date stipulated in the Notice to Proceed. It is understood and agreed that time is of the essence of the Contract and the Bidder agrees to complete the work within the Contract time specified.

Should the Contractor fail to complete the work under these Contract Documents within the time specified, the Contractor shall pay to the Owner, as liquidated damages and not as a penalty, the amount specified in the Contract Documents per calendar day of default, unless extensions of time granted by the Owner specifically provide for the waiving of liquidated damages.

10. RETAINAGE

The provisions of TCA 66-11-114 for Retainage are applicable to all contracts for the improvement of real property when the contract price is equal to or greater than five hundred thousand dollars (\$500,000). Payments for Retainage to be placed in an interest bearing account designated by the Owner will be made only if the Owner is obligated to pay interest on Retainage to the contractor under State Law TCA 66-11-144.

11. SUBCONTRACTOR PERIODIC PAYMENTS

As stipulated in these Contract Documents, the contractor will be required to pay all subcontractors periodic payments for the successful work done on the project within fifteen (15) days of the contractor receiving a payment from the Owner. Thereafter, upon the completion of the project and acceptance by the Owner, the contractor shall receive any and all retainage previously withheld by the Owner, and shall pay to all subcontractors any retainage due said subcontractor(s) within fifteen (15) days following the contractor's receipt of said payment. Penalties for non-compliance shall be assessed according to Article 6.06 of the Supplemental General Conditions. Payment disputes shall be resolved according to Article 16 of the Supplemental General Conditions.

CONTRACTOR'S IDENTIFICATION

City of Chattanooga Parks, Recreation
Arts and Culture Department
City Hall 2nd Floor
216 East 11th Street
Chattanooga, TN 37404

SEALED BID PROPOSAL FOR:
Dupont Soccer Complex
at North Access Road

Attach this form to the sealed envelope containing the Bid. Failure to provide required information on the sealed envelope will be considered a non-responsive Bid.

BIDDER:

Name: _____

Address: _____

Tennessee License No. _____

Expiration Date _____

Classification _____

Monetary Limit \$ _____

Complete the following for all required Subcontractors:

Subcontractor (Grading) _____

Tennessee License No. _____

License Expiration Date _____

License Classification _____

Subcontractor(Irrigation): _____

Tennessee License No. _____

License Expiration Date _____

License Classification _____

Subcontractor (Electrical): _____

Tennessee License No. _____

License Expiration Date _____

License Classification _____

Subcontractor (Plumbing): _____

Tennessee License No. _____

License Expiration Date _____

License Classification _____

Subcontractor (): _____

Tennessee License No. _____

License Expiration Date _____

License Classification _____

Subcontractor (): _____

Tennessee License No. _____

License Expiration Date _____

License Classification _____

CAUTION: T.C.A. Section 62-6-119(b) requires all bidders to list the name, license number, expiration date thereof, and license classification of the contractors applying to bid for the prime contract and for the electrical, plumbing, heating, ventilation, and air conditioning contracts on the outside of the envelope containing the bid if the subcontractor's bid amount(s) is \$25,000.00 or more.

END OF SECTION 00100

BID FORM FOR UNIT PRICES

Project: **Dupont Soccer Complex @ North Access Road**

This Bid is submitted to: City of Chattanooga
 Parks, Recreation, Arts and Culture Department
 City Hall 2nd Floor
 216 East 11th Street
 Chattanooga, TN 37404

1. The undersigned bidder proposes and agrees, if this bid is accepted, to enter an agreement with Owner in the form indicated in the Contract Documents for the contract price within the contract time indicated in this bid.
2. Bidder has carefully examined the plans, the technical specifications, the General Conditions, the Supplementary Conditions, Instructions for Bidders, the form of the contract, the form of bonds, and all other contract documents, and thoroughly understands their stipulations, requirements, and provisions.
3. Bidder has examined the site and locality where the work is to be performed, the legal requirements (federal, state and local laws, ordinances, rules and regulations) and all conditions affecting cost, progress, or performance of the work. Bidder has made such independent investigations as bidder deems necessary to become thoroughly familiar with the conditions under which the work will be performed.
4. Bidder understands that a price for each item on the bid schedule must be filled in as stated in Instructions for Bidders. Failure to indicate price for alternates, if any, may be grounds for considering the bid irregular. Unit prices on the bid schedule shall include all labor, materials, erosion control, shoring, removal, safety measures, overhead, profit, insurance, etc. to cover the finished work.
5. Bidder agrees that, if awarded the contract, all work thereunder shall be conducted in such a manner and with sufficient materials, labor, tools, equipment, apparatus, and incidentals as is necessary to insure satisfactory completion of the project within **150** calendar days from the date stipulated in the Notice to Proceed.
6. Bidder accepts the provisions of the Agreement as to liquidated damages of **\$350** per day in the event of failure to complete the work on time.
7. Bidder represents that this bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation.
8. Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.
9. Bidder will complete the work as described in the specifications for the price(s) as shown on the following bid schedules.

11. LUMP SUM AMOUNT

Bidder will complete the Work in accordance with the Contract Documents for the lump sum amount of _____ dollars (\$ _____). Amount shall be shown in both words and figures, In case of discrepancy, the amount shown in words will govern.

12. ALTERNATES - The following alternative shall modify the lump sum amount as follows:

Alternate #1:

Include clearing, grubbing, topsoil removal/respread, grading (cut/fill/compaction), storm drainage, 8" thick gravel topping in driveways and parking areas, 4" thick gravel walkways, sediment and erosion control BMP's, temporary seeding and permanent seeding.

Total Alternate #1: _____ (dollars) \$_____
(Use words)

Alternate #2:

Include 2" asphalt topping in parking areas and walkways and pavement marking in Alternative #1 area.

Total Alternate #2: _____ (dollars) \$_____
(Use words)

Alternate #3:

Sod all four soccer fields (240' x 360' x 4 ea) in lieu of sprigging and include areas between fields 2 to 3 and fields 3 to 4 (50' x 360' x 2 ea).

Total Alternate #3: _____ (dollars) \$_____
(Use words)

Alternate #4

Include 8 regulation portable tubed steel soccer goals and netting.

Total Alternate #4: _____ (dollars) \$_____
(Use words)_

Alternate #5

Include 25 each permanent field location markers per field (installed by registered surveyor)

Total Alternate #5: _____ (dollars) \$_____
(Use words)

Alternate #6

Upgrade Field #1 lighting from 30 CW to 50 CW.

Total Alternate #6: _____ (dollars) \$_____
(Use words)

Alternate #7

Total Alternate #7: _____ (dollars) \$_____

(Use words)

Alternate #8

Total Alternate #8: _____ (dollars) \$ _____
(Use words)

13. DEDUCTIONS – The following deduction shall modify the lump sum amount as follows:

Deduct #1

Total Deduct #1: _____ (dollars) \$ _____
(Use words)

Deduct #2

Total Deduct #2: _____ (dollars) \$ _____
(Use words)

Deduct #3

Total Deduct #3: _____ (dollars) \$ _____
(Use words)

14. UNIT PRICES

- (a) Rock Excavation (CY) \$ _____ per cubic yard
- (b) Import from offsite borrow pit of select fill \$ _____ per cubic yard (compacted in-place)
- (c) Export of unsuitable material to an approved offsite area \$ _____ per cubic yard
- (d) Undercutting of unsuitable material under proposed building or paved areas up to depths of 2 feet \$ _____ per cubic yard (loose yards)
- (e) Sink hole repair (per detail on Sheet C-17) \$ _____ per each.
- (f) Field light pole reinforcement (per note ES-1) \$ _____ per each.

15. The Bidder is hereby acknowledging that the following documents are attached to and made a condition of this Bid:

- a) Required Bid Security in the form of: _____ Bid Bond.
- b) Required Drug-Free Workplace Affidavit
- c) Required Bidder's Statement of Qualifications.
- d) Required Bidder's Statement of Equipment.
- e) Acknowledgment of Addenda #'s _____, _____, _____, f)
_____, _____, _____, _____, _____, _____

An Individual

By _____ (SEAL)

(Individual's Name)

doing business as _____

Business Address: _____

Phone No.: _____ Business License No.: _____

A Partnership

By _____ (SEAL)

(Firm Name)

(general partner)

Business Address: _____

Phone No.: _____ Business License No.: _____

A Corporation

By _____
(Corporation Name)

(state of incorporation)

By _____
(name of person authorized to sign)

Business Address: _____

Phone No.: _____ Business License No.: _____

A Joint Venture

By _____
(Name)

(Address)

By _____
(Name)

(Address)

Phone No.: _____ Business License No.: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above.)

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,

as Principal, and _____
as Surety, are hereby held and firmly bound unto City of Chattanooga, Tennessee as Owner in the penal
sum of _____ for the payment of which, well and truly to be made, we hereby
jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed, this _____ day of _____, 2001.

The condition of the above obligated is such that whereas the Principal has submitted to City of Chattanooga, Tennessee, a certain Bid, attached hereto and hereby made a part hereof to enter into a contract in writing for the Dupont Soccer Complex @ North Access Road.

NOW, THEREFORE,

- (a) If said Bid shall be rejected, or in the alternate.
- (b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid, then this obligation shall be void, otherwise the same shall remain in force and effect, it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The surety for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____ Surety	_____ Principal (L.S.)
By: _____	_____ Title
_____ Title	

SEAL

Note: Bond may be declared invalid if not accompanied by Power of Attorney.

DRUG-FREE WORKPLACE AFFIDAVIT
OF PRIME BIDDER

STATE OF TENNESSEE
COUNTY OF _____

NOW COMES AFFIANT, who being duly sworn, deposes and says:

1. He/She is the principal officer for _____
(Address) _____

2. That the bidding entity has submitted a bid to the City of Chattanooga Department of Parks, Recreation, Arts & Culture, PRAC Project # _____ for the construction of Dupont Soccer Complex @ North Access Road.
3. That the bidding entity employs no less than five (5) employees;
4. That Affiant certifies that the bidding entity has in effect, at the time of submission of its bid to perform the construction referred to above, a drug-free workplace program that complies with §50-9-113, Tennessee Code Annotated.
5. That this affidavit is made on personal knowledge.

Further Affiant saith not.

AFFIANT

SUBSCRIBED AND SWORN TO before me this _____ day of _____, 200__.

NOTARY PUBLIC

My commission expires: _____

Affirmative Action Plan
For
Dupont Soccer Complex @ North Access Road

(Name of Contractor)

The above named Contractor is an equal opportunity employer and during the performance of this contract, the Contractor agrees to abide by the Affirmative Action Plan of the City of Chattanooga as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, or handicap. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, or handicap. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay, or other forms of compensation, and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.
2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin, or handicap.
3. The Contractor will send to each labor union or representative of workers with which he/she has a collective bargaining agreement or other contract or understanding, a notice advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
4. It is the goal of the Contractor to have a workforce with a minimum of 8.6 percent minority and 6.9 percent female employees.
5. This Plan or any attachments thereto shall further provide a list of all employees annotated by job function, race, and sex who are expected to be utilized on this project.
6. During the term of this contract the following non-discriminatory hiring practices shall be employed to provide employment opportunities for minorities and women:
 - a. All help wanted ads placed in newspapers or other publications shall contain the phrase "Equal Employment Opportunity Employer".

- b. Maintain systematic contracts with minority groups and human relations organizations.
 - c. Encourage present employees to refer qualified minority group and female applicants for employment opportunities.
 - d. Use only recruitment sources which state in writing that they practice equal opportunity. Advise all recruitment sources that qualified minority group members and women will be sought for consideration for all positions when vacancies occur.
7. During the term of this contract, the Contractor, upon request of the City of Chattanooga Office of Economic and Community Development, will make available for inspection by the City of Chattanooga Office of Economic and Community Development, copies of payroll records, personnel records, documents and other records that may be used to verify Contractor compliance with these equal opportunity provisions.
8. The Contractor agrees to notify the City of Chattanooga Office of Economic and Community Development of any failure or refusal on the part of the contractor or any subcontractors to comply with the equal opportunity provisions set forth. Any failure of refusal to comply with the aforementioned provisions by the Contractor and/or Subcontractors shall be a breach of this contract.

(Signature of Contractor)

(Title and Name of Construction Company)

(Date)

STATEMENT OF QUALIFICATIONS

The Undersigned certifies under oath the truth and correctness of all statements and of all answers to questions made hereinafter.

SUBMITTED BY: _____

☐ Corporation

SUBMITTED BY: NAME _____

☐ Partnership

ADDRESS _____

☐ Individual

☐ Joint

PRINCIPAL OFFICE _____

☐ Other

(NOTE: Attach separate sheets as required)

1. How many years has your organization been in business as a General Contractor?

2. How many years has your organization been in business under its present business name?

3. If a Corporation, answer the following:

Date of Incorporation: _____

State of Incorporation: _____

President: _____

Vice President(s): _____

Secretary: _____

Treasurer: _____

4. If a Partnership, answer the following:

Date of Organization: _____

Type of Partnership: _____

(General/Limited/Assoc.)

Name and Address of all partners:

5. If other than a Corporation or Partnership, describe Organization and name Principals:

6. What percent of the work do you normally perform with your own forces? _____

List Trades:

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

7. Have you ever failed to complete any work awarded to you? If so, indicate when, where, and why:

8. Has any Officer or Partner of your Organization ever been an Office or Partner of another Organization that failed to complete a construction contract? _____ If so, state circumstances:

9. List the construction projects your Organization has under contract on this date:

PROJECT NAME	NAME	ARCH/ENG	CONTRACT AMOUNT	CONTRACT DATE	% COMPLETE	SCHEDULED COMPLETION

10. List major construction projects your organization has completed in the past five years:

PROJECT NAME	NAME	ARCH/ENG	CONTRACT AMOUNT	CONTRACT DATE	% COMPLETE	SCHEDULED COMPLETION

11. List major construction projects your organization has completed that are similar in importance and character to this project:

PROJECT	CONTRACT	CONTRACT	%	SCHEDULED
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NAME	NAME	ARCH/ENG	AMOUNT	DATE	COMPLETE	COMPLETION

12. List the construction experience of the principal individuals in your Organization:

PROJECT NAME	NAME	ARCH/ENG	CONTRACT AMOUNT	CONTRACT DATE	% COMPLETE	SCHEDULED COMPLETION

13. List states and categories in which your Organization is legally qualified to do business:

14. Bank References:

15. Trade References:

16. Name of Bonding and Insurance Companies and Name and Address of Agents:

Max. Bonding Capacity _____

17. The undersigned agrees to furnish, upon request by the Owner, within 24 hours after the Bid Opening, a current Statement of Financial Conditions, including Contractor's latest regular dated financial statement or balance sheet which must contain the following items:

Current Assets: (Cash, joint venture accounts, accounts receivable, notes receivable, accrued interest on notes, deposits, and materials and prepaid expenses) net fixed assets and other assets.

Current Liabilities: (Accounts payable, notes payable, accrued interest on notes, provisions for income taxes, advances received from owners, accrued salaries, accrued payroll taxes), other liabilities, and capital (capital stock, authorized and outstanding shares par values, earned surplus).

Date of statement or balance sheet: _____

Name of firm preparing statement: _____

By: _____
(Agent and Capacity)

18. Dated at _____ this _____ day of _____, 20____.
Name of Organization: _____
By: _____
Title: _____

19. NOTARIZATION: State of _____ County of _____
M_____ being duly sworn deposes and says that
he/she is the _____ of _____
Contractor(s) and that the answers to the foregoing questions and all statements
therein contained are true and correct.

Subscribed and sworn before me this _____ day of _____, 20 ____.

Notary Public: _____

My Commission Expires: _____

SUBCONTRACTOR'S BID LIST

<u>Name, Address, Phone No.</u>	<u>Items/Areas Contracted</u>	<u>Amount</u>
_____	_____	
_____	_____	
_____	_____	
_____	_____	
local business license	_____	_____
_____	_____	
_____	_____	
_____	_____	
_____	_____	
local business license	_____	_____
_____	_____	
_____	_____	
_____	_____	
_____	_____	
local business license	_____	_____
_____	_____	
_____	_____	
_____	_____	
_____	_____	
local business license	_____	_____

I, We, the undersigned, hereby certify the above information and understand that these bids are made a part of the total bid and shall not be changed in any way without being reflected in the total bid.

BIDDER (authorized signature) _____ Date: _____

STATEMENT OF EQUIPMENT

Showing Machinery and Other Equipment Available for Executing the Work Included in Contract. (To be filled in and submitted with Proposal.)

Available Machinery and Other Equipment			Date Proposed
Type - Size - Capacity	Location	Ownership	To Be Placed On
Work			

The above is a true statement of the equipment to the undersigned Bidder for executing the work included in the contract. Where it is shown that the equipment is not owned by the Bidder, arrangements have been made with the owners to furnish the equipment.

Signed _____

Name _____

Title _____

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 20_____,
by and between CITY OF CHATTANOOGA, TENNESSEE hereinafter called OWNER,
and _____, hereinafter called CONTRACTOR.

The Project:

The OWNER and the CONTRACTOR agree as set forth below.

Article 1. WORK

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

Article 2. ENGINEER

The project has been designed by: March Adams & Associates, Inc., P.O. Box 3689, Chattanooga, TN 37404, who will act as the ENGINEER in connection with completion of the project in accordance with the Contract Documents.

Article 3. CONTRACT TIME

The Work will be completed and ready for final payment within 150 calendar days from and including the date stipulated in the Notice to Proceed for the contract time to commence.

If the CONTRACTOR shall fail to complete the Work within the time stipulated in this agreement or any extensions thereof allowed in accordance with Article 12 of the General Conditions, the CONTRACTOR shall pay to the OWNER liquidated damages in the amount of \$350.00 for each calendar day of delay until the Work is substantially completed.

Article 4. CONTRACT PRICE

The OWNER shall pay the CONTRACTOR for completion of the Work in accordance with the Contract Documents as follows:

Unit prices as bid in accordance with the bid form as provided in
the Contract Documents.

Article 5. PAYMENT PROCEDURES

The OWNER will make progress payments on account of the Contract Price as provided in the General Conditions as follows:

- 5.1. Progress and final payments will be on the basis of the CONTRACTOR'S Applications for payment as approved by the ENGINEER.
- 5.2. On or about the 15th day of each month progress payments will be made in an amount equal to the percentage indicated below, but, in each case less the aggregate of payments previously made and less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.7 of the General Conditions.

Ninety percent (90%) of the Work completed and ninety percent (90%) of materials and equipment not incorporated in the Work but delivered, suitably stored, and accompanied by documentation satisfactory to OWNER as provided in paragraph 14.2 of the General Conditions.
- 5.3. Upon substantial completion, progress payments will be made in an amount sufficient to increase total payments to CONTRACTOR to ninety-five percent (95%) of the Contract Price, less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.7 of the General Conditions.
- 5.4. Upon final completion and acceptance of the Work and settlement of all claims, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in paragraph 14.13 of the General Conditions.

Article 6. INTEREST

If the Contract Price is \$500,000.00 or greater, all moneys not paid when due shall bear interest at the legal rate not to exceed 5% annually.

Article 7. CONTRACT DOCUMENTS

The Contract Documents which comprise the entire contract between the OWNER and the CONTRACTOR are listed as follows:

- 7.1. This Agreement (pages 1 to 4 inclusive)
- 7.2. Exhibits to this Agreement (pages ____ to ____ inclusive)
- 7.3. CONTRACTOR'S bid (pages ____ to ____ inclusive)
- 7.4. CONTRACTOR'S Performance and other Bonds (consisting of ____ pages)
- 7.5. The Project Manual, consisting of:
 - a) Bidding Requirements
 - b) Contract Forms
 - c) Conditions of the Contract
 - d) Division 1 - General Requirements

- e) Division 2 - Sitework
 - f) Division 3 – Concrete
 - g) Division 4 – Masonry
 - h) Division 5 – Structural Steel
 - i) Division 15 – Mechanical
 - j) Division 16 - Electrical
- 7.6. Project Drawings consisting of a cover sheet and sheets numbered ____ through ____ inclusive
- 7.7. Addenda, numbers _____ to _____ inclusive
- 7.8. The following which may be delivered or executed after the Effective date of the Agreement:
- any written amendments or other documents amending, modifying, or supplementing the Contract Documents pursuant to paragraphs 3.4 and 3.5 of the General Conditions.

Article 8. MISCELLANEOUS

- 8.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions shall have the meanings indicated in the General Conditions.
- 8.2. Neither the OWNER nor the CONTRACTOR shall, without the prior written consent of the other, assign or sublet in whole or in part his interest under any of the Contract Documents, and specifically, the CONTRACTOR shall not assign any moneys due or to become due without the prior written consent of the OWNER.
- 8.3. The OWNER and the CONTRACTOR each binds himself, his partners, successors, assigns and legal representatives to the other party hereto in respect of all covenants, agreements and obligations contained in the Contract Documents.
- 8.4. The Contract Documents constitute the entire agreement between the OWNER and the CONTRACTOR and may only be altered, amended or repealed by a duly executed written instrument.

IN WITNESS WHEREOF, the OWNER and CONTRACTOR have entered into this Agreement as of the day and year first written above.

OWNER: City of Chattanooga, Tennessee CONTRACTOR

By: _____ By: _____

Title: City of Chattanooga Executive

Title:

Resolution No.: _____

[CORPORATE SEAL]

Attest: _____

Attest: _____

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that _____ having an office at _____, as Principal, hereinafter called CONTRACTOR, and _____, having an office at _____, as Surety, hereinafter called Surety, are held and firmly bound unto the _____, having an office at _____, as Obligee, hereinafter called OWNER, for the use and benefit of claimants as hereinbelow defined, in the amount of _____ Dollars (\$ _____), for they payment whereof CONTRACTOR and Surety bind themselves, their heirs, executors, administrations, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, CONTRACTOR has by written agreement dated _____, 2003 entered into a Contract with the OWNER for the construction of the project entitled Dupont Soccer Complex @ North Access Road, Chattanooga, Tennessee in accordance with Drawings and Specifications prepared by **March Adams & Associates, Inc.**, which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, the condition of this obligation is such that, if CONTRACTOR shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the OWNER.

Whenever CONTRACTOR shall be and declare by OWNER to be in default under the Contract, the Surety shall promptly remedy the default. If the OWNER terminates the Contract for such default, the following precautions shall govern the liability of the CONTRACTOR and the Surety hereunder.

In the event of such termination, the CONTRACTOR and the Surety shall remain fully liable to the OWNER for the CONTRACTOR'S failure to timely complete the Contract, any additional costs incurred by the OWNER in completing the Contract, and liquidated damages from the originally scheduled completion date to the date of the actual completion of the work by the OWNER.

In the event of such termination, the Surety company may elect to take over and complete performance of the Contract by giving written notice to the OWNER of such determination within seven (7) days of the OWNER'S mailing of notice of termination to the Surety and actually commencing completion with fourteen (14) days of the OWNER'S notice to the Surety.

The Surety shall fully complete the work by the originally scheduled date of completion and the CONTACTOR and the Surety shall remain liable to the OWNER for all damages sustained by the OWNER and for liquidated damages for delay.

Any suit under this bond must be instituted before the expiration of one (1) year from the date on which final payment under the Contract falls due or before the expiration of two (2) years from the Date of Substantial Completion of the Project, whichever is later.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the OWNER named herein or the heirs, executors, administrators or successors of the OWNER.

Signed and sealed this _____ day of _____, 20_____.

WITNESS:

CONTRACTOR:

(SEAL)

Witness

By: _____

Title

WITNESS:

Name of Surety

(SEAL)

Witness

By: _____
Attach Power of Attorney

Title

LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that _____ having an office a _____, as Principal, hereinafter called CONTRACTOR, and _____, having an office at _____, as Surety, hereinafter called Surety, are held and firmly bound unto _____, having an office at _____, as Obligee, hereinafter called OWNER, for the use and benefit of claimants as hereinbelow defined in the amount of _____ Dollars (\$ _____), for the payment whereof CONTRACTOR and Surety bind themselves, their heirs, executors, administrators, successor and assigns, jointly and severally, firmly by these presents.

WHEREAS, CONTRACTOR has by written agreement _____, 2002, entered into a Contract with the OWNER for the construction of the project **Dupont Soccer Complex @ North Access Road, for the City of Chattanooga, Tennessee**, in accordance with Drawings and Specifications prepared by **March Adams & Associates, Inc.**, which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if CONTRACTOR shall promptly make payment of all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however to the following conditions:

1. A claimant is defined as one having a direct contract with the CONTRACTOR or with a Subcontractor of the CONTRACTOR for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.
2. The above named CONTRACTOR and Surety hereby jointly and severally agreed with the OWNER that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgement for such sum or sums as may be justly due claimant, and have execution thereon. The OWNER shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:
 - a) Unless claimant, other than one having a direct contract with the CONTRACTOR, shall have given written notice to any two of the following: the CONTRACTOR, the OWNER or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the CONTRACTOR, OWNER or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.
 - b) After the expiration of one (1) year following the date on which CONTRACTOR ceased Work on said Contract or after the expiration of one (1) year following the Date of Substantial Completion of the Project, whichever is later, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.
 - c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, on any part thereof, is situated, and not elsewhere.
4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against such improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this _____ day of _____, 20____.

WITNESS:

CONTRACTOR:

(SEAL)

Witness

By: _____

Title

WITNESS:

Name of Surety

(SEAL)

Witness

By: _____
Attach Power of Attorney

Title

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that _____, having an office _____, as Principal, hereinafter called CONTRACTOR, and _____, having an office at _____, as Surety, hereinafter called Surety, are held and firmly bound unto the _____, having an office at _____, as Obligee, hereinafter called OWNER, for the use and benefit of claimants as hereinbelow defined, in the amount of _____ Dollars (\$ _____), for they payment whereof CONTRACTOR and Surety bind themselves, their heirs, executors, administrations, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, CONTRACTOR has by written agreement dated _____, 2032, entered into a Contract with the OWNER for the construction of the project **entitled Dupont Soccer Complex @ North Access Road, for the City of Chattanooga, Tennessee,** in accordance with Drawings and Specifications prepared by **March Adams & Associates, Inc.,** which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said CONTRACTOR shall well and truly, at the request of the said Obligee, by its proper representatives or representative, remedy any defects in work done or materials used by the CONTRACTOR in performance of the Contract, (regardless of whether such materials were furnished by CONTRACTOR or not), which defects develop during a period of twelve (12) months from the date of completion of the work performed under the Contract, provided, such defects are caused by defective materials or workmanship, then this obligation shall be void, otherwise to be and remain in full force and effect.

IN WITNESS WHEREOF, the CONTRACTOR and Surety, intending to be legally bound hereby, have signed and sealed these presents this _____ day of _____, 20____.

WITNESS:

CONTRACTOR:

(SEAL)

Witness

By: _____

Title

WITNESS:

Name of Surety

(SEAL)

Witness

By: _____
Attach Power of Attorney

Title

SECTION 00700
GENERAL CONDITIONS

The Engineer's Joint Contract Documents Committee's "Standard General Conditions of the Construction Contract", latest edition, is hereby made a part of the specifications to the same extent as if herein written out in full.

END OF SECTION 00700

SECTION 00800
SUPPLEMENTARY GENERAL CONDITIONS

SC - 0 GENERAL

- SC - 0.1 These Supplementary General Conditions amend or supplement the Standard General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented shall remain in full force and effect.

Any provision of these Supplemental General Conditions which pertains to a nonexistent condition and is not applicable to the work to be performed hereunder shall have no meaning in these Contract Documents and shall be disregarded.

- SC - 0.2 General Conditions: The General Conditions are general in scope and may refer to conditions not encountered on the work covered by these Contract Documents. Any provision of the General Conditions which pertains to a nonexistent condition and is not applicable to the work to be performed hereunder, or which conflicts with any provision of the Supplementary General Conditions or Specifications, shall have no meaning in these Contract Documents and shall be disregarded.

- SC - 0.3 Specifications: No attempt has been made in the Specifications to segregate work to be performed by any trade or subcontract. Any segregation between the trades or crafts will be solely a matter for agreement between the Contractor and his employees and his subcontractors.

The Specifications as a whole will govern the construction of the entire work. The applicable provisions thereof will govern work to be performed under each section.

- SC - 0.4 Legal Addresses: Both the business address of the Contractor given in the Bid Form and the Contractor's office in the vicinity of the work either of which are hereby designated as the place to which all notices, letters, and other communication to the Contractor will be mailed or delivered.

The address of the Engineer is P.O. Box 3689, Chattanooga, Tennessee, 37402. This address is hereby designated as the place to which all notices, letters, and other communication to the Owner and/or the Engineer shall be mailed or delivered. Either party may change his address at any time by an instrument in writing delivered to the other party.

- SC - 0.5 Independent Contractor: The relation of the Contractor to the Owner shall be that of an independent contractor.

- SC - 0.6 Governing Standard Specifications: Standard specifications or other specifications of organizations, societies, governmental agencies, or bodies, referred to in these Contract Documents, are made a part of these Contract Documents the same as if repeated herein. Unless specifically stated otherwise, the standard shall be that adopted and published at the date of the Advertisement for Bids.

- SC - 0.7 The Contractor will not discriminate in the hiring, training, promotion, or termination of employees on the basis of race.

SC - 1 DEFINITIONS AND TERMINOLOGY

ADD NEW PARAGRAPHS AS FOLLOWS:

- SC - 1.01.A.11(a) Contract or Agreement: The written agreement between the Owner and the Contractor for the performance of the work in accordance with the requirements of the Contract Documents and for the payment of the agreed consideration therefor. Whenever, in any portion of the Contract Documents, a requirement of the Contract is stated, it shall be interpreted to mean a requirement of the Contract Documents as defined herein.
- SC - 1.01.A.14(a) Contract Time: The number of calendar days allowed by these Contract Documents for the completion of the work, including authorized time extensions. The contract time shall begin on the date stipulated in the Notice to Proceed.
- SC - 1.01.A.17(a) Drawings: Drawings, which are sometimes referred to herein as "plans," are defined as all (a) drawings furnished by the Owner or Engineer as a basis for bids; (b) supplementary drawings furnished by the Owner or Engineer to clarify and to define in greater detail the intent of the Contract Drawings and Specifications; (c) drawings submitted by the successful bidder with his bid, provided such drawings are acceptable to the Owner; (d) drawings furnished by the Owner or Engineer to the Contractor during the progress of the work; and (e) engineering data and drawings submitted by the Contractor during the progress of the work, provided such drawings are acceptable to the Owner and the Engineer.
- SC - 1.01.A.17(b) Project Record Documents: Copies of the Contract Documents maintained at the site of the work by the Contractor, and marked by him to record deviations, additions, and other required information during the prosecution of the work.

SC - 2 PRELIMINARY MATTERS

ADD NEW PARAGRAPHS AS FOLLOWS:

SC - 2.03.B

As time is of the essence in this Contract, should the Contractor fail to complete the work, or specified portion thereof, sufficient for acceptance as substantially complete by the Owner within the contract time and extension thereof, it is understood and agreed that the Contractor shall pay the Owner, as acknowledged liquidated damages, the amount of \$350.00 per calendar day that he is delinquent. The amount of liquidated damages shall be reported by the Engineer and shall be paid by the Contractor to the Owner or shall be deducted and withheld by the Owner from the moneys due or to become due to the Contractor under the terms of these Contract Documents.

SC - 2.03.C

It is understood and agreed that these liquidated damages are not a penalty, but constitute liquidated damages for loss to the Owner because of increases in expenses for administration, legal counsel, accounting, engineering and construction supervision, construction inspection, and any other expenses incurred directly as a result of the delay of the Contractor in completing the work.

In the event the Contractor is in default and the Contract has been terminated or the Contractor is not due any moneys from the Owner, Contractor agrees to pay Owner such liquidated damages for the delays to be paid directly by the Contractor or its surety.

SC - 3 CONTRACT DOCUMENTS; INTENT, AMENDING, REUSE

ADD NEW PARAGRAPHS AS FOLLOWS:

SC - 3.01.D

The Contractor shall keep on the job a copy of the Drawings and Specifications and shall at all times give the Owner and Engineer access thereto. Anything mentioned in the Specifications and not shown on the Drawings or shown on the Drawings and not mentioned in the Specifications shall be of like effect as if shown or mentioned in both.

SC - 3.01.E

The Contractor shall not take advantage of any errors or omissions which may exist in the Drawings and Specifications, but shall immediately call them to the attention of the Engineer whose prompt interpretation or correction thereof shall be conclusive.

SC - 3.01.F

In case of unresolved conflict between items of the Contract Documents, the following order of precedence shall govern, with the higher item taking precedence over a lower item:

- Contract (including Supplemental Agreements and Change Orders thereto)
- Addenda
- Instructions to Bidders
- Bid
- Supplemental General Conditions
- General Conditions
- Specifications
- Governing Standard Specifications
- Schedules on Drawings
- Notes on Drawings
- Details on Drawings
- Large Scale Drawings
- Small Scale Drawings
- Shop Drawings
- Dimensions Given in Figures
- Scaled Dimensions

SC - 5 BONDS AND INSURANCE

ADD NEW PARAGRAPHS AS FOLLOWS:

SC - 5.01A

The Contractor shall not commence work under these Contract Documents until he has obtained all insurance required herein nor shall the Contractor allow any Subcontractor to commence work on his subcontract until similar insurance required of the Subcontractor has been obtained by the Subcontractor. Insurance shall be placed by the Contractor with one or more insurance carriers licensed to do business in the State of Tennessee. Each insurance policy shall be renewed ten (10) days before the expiration date of the policy.

SC - 5.01B

Certificates of insurance shall be filed with the City prior to commencement of the work. These certificates shall contain a provision that coverages afforded under the policies will not be changed or canceled unless at least fifteen (15) days' written notice has been given to the City. The Contract shall not be binding upon the City until the insurance coverage required herein has been obtained and certificates have been filed with the City.

SC - 5.01C

Adequate insurance coverage shall be maintained by the Contractor at all times. Failure to maintain adequate coverage shall not relieve the Contractor of any responsibilities or obligations under these Contract Documents. In the event any insurance coverage is canceled or allowed to lapse, the Contractor will not be permitted to prosecute the work until adequate and satisfactory insurance has been obtained and certificates of insurance furnished to the City. Failure to keep insurance policies in effect will not be cause for any claims for extension of time under these Contract Documents.

SC - 5.01D

All such policies shall be subject to approval by the City Attorney. Should the City Attorney at any time in his sole discretion determine that the insurance policies and certificate provided may not be sufficient to protect the interests of the City because of the insolvency of the insurance company or otherwise, the Contractor shall replace such policies with policies meeting his approval.

SC - 5.01E

The Contractor shall procure and maintain at his own expense, during the Contract Time, insurance as hereinafter specified:

Workmen's Compensation Insurance that shall protect the Contractor against all claims under applicable state workmen's compensation laws shall be maintained. The Contractor shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workmen's compensation law. This policy shall also include an endorsement providing coverage in all states in which work is performed. The Contractor shall require all the Subcontractors to provide similar Workmen's Compensation Insurance for all the Subcontractors' employees on the work unless such employees are covered by the protection afforded by the Contractor. The liability limits shall not be less than that required by the statute.

General Public Liability and Property Damage Insurance that shall be written in comprehensive form and shall protect the Contractor against all claims arising from injuries including death, to members of the Public or damage to property of others arising out of any act or omission of the Contractor or his agents, employees, or Subcontractors. In addition, this policy shall specifically insure the contractual liability assumed by the successful bidder to defend and indemnify the City of Chattanooga against such claims or suits.

To the extent that the work may require blasting, explosive conditions or underground operation, the comprehensive general public liability and property damage coverage shall contain no exclusion relative to blasting, explosion, collapse of buildings, or damage to underground property.

The comprehensive general public liability and property damage coverage shall also protect the Contractor against all claims resulting from damage to:

1. Private driveways, walks, shrubbery, and plantings
2. Public utility facilities
3. United States Government monuments

The liability limits shall not be less than:

Bodily Injury	\$ 500,000 each person
	\$1,000,000 each occurrence
Property Damage	\$ 250,000 each occurrence
	\$ 500,000 aggregate

The general public liability and property damage insurance shall carry an endorsement in form satisfactory to the City to the effect that the Contractor shall save harmless the City from any claims and damage whatsoever, including patent infringement. General public liability and property damage insurance shall be kept in force at all times during the course of the work until such time as the work covered by these Contract Documents has been completed and accepted by the City.

Comprehensive Motor Vehicle Liability and Property Damage Insurance that shall be written in comprehensive form and shall protect the Contractor against all

claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operation on or off the site of all motor vehicles licensed for highway use, whether they are owned, non-owned, or hired.

The liability limits shall not be less than:

Bodily Injury	\$ 250,000 each person
	\$ 500,000 each occurrence

Property Damage	\$ 100,000 each occurrence
-----------------	----------------------------

The Contractor (not the Owner) shall purchase and maintain until Substantial Completion Builder's Risk Insurance (not All Risk Insurance) in the amount of the initial Contract Sum plus any amounts added by Change Order. The insurance shall list and include as named insured the City of Chattanooga, the Contractor, and all Subcontractors A.T.I.M.A. The deductible amount shall be \$1,000.00 for each occurrence, which shall be paid by the Contractor. The Builder's Risk Insurance shall also provide coverage for portions of the work in transit and for temporary storage of portions of the work to the value approved by the City in the Certificate for Payment.

SC - 6 CONTRACTOR'S RESPONSIBILITIES

ADD NEW PARAGRAPHS AS FOLLOWS:

SC - 6.02.B.1

In accordance with paragraph 6.3 of the General Conditions, all work shall be performed during regular working hours, and those hours shall be agreed to between Owner, Engineer and Contractor prior to the beginning of the project. The Contractor WILL NOT permit overtime work or the performance of work on Saturday, Sunday, or any legal holiday without a WRITTEN request from Contractor to Engineer and receipt of WRITTEN consent from Owner. The Owner shall consider Owner's obligations in the employment of Engineer and construction inspectors (in accordance with paragraph SC - 9.03B) for the performance of overtime work and shall consider any potential disruption of the general public or other effects of overtime work at the site prior to giving consent for such work.

SC - 6.03.B.1

Materials, products, and equipment designated for permanent installation in the work shall be properly stored by the Contractor in a manner to ensure protection against deterioration of any type. These items shall be so placed as to cause a minimum of interference with the prosecution of the work and to the public. The method of storing shall be so as to facilitate inspection. Deterioration of any kind or to any degree shall be cause for rejection. Stored materials, even though meeting the requirements of these Contract Documents before being stored, shall be inspected prior to incorporation in the work and shall meet the requirements of these Contract Documents at the time of incorporation in the work. If material stored by the

Contractor and paid for under the terms of these Contract Documents is damaged or otherwise becomes unsuitable before its permanent incorporation into the work, the amounts paid the Contractor for the damaged material shall be deducted from the next progress payment.

SC - 6.06.H

SUBCONTRACTORS: The Contractor shall give his personal attention to the fulfillment of the Contract and shall at all times keep the work under his control.

SC - 6.06.I

The approval of the Owner of any subcontractor shall not, under any circumstances, operate to relieve the Contractor or his sureties of any of his or their obligations under these Contract Documents. It is understood and agreed that all subcontracts and approvals of subcontractors shall be based upon the requisite of performance by the subcontractor in accordance with these Contract Documents; and should any subcontractor fail to perform his work to the satisfaction of the Engineer, the Owner shall have the absolute right to rescind his approval at once and to require the performance of such work by the Contractor or entirely or in part through other approved subcontractors.

The Contractor shall require all subcontractors to submit their Business Tax License Number and State Contractor's License if subcontractor's portion of the work exceeds \$25,000.

The Contractor shall submit a list of names, addresses, and business tax license numbers of proposed subcontractors, together with the type of work to be provided, to Owner or Engineer within 24 hours of the Bid Opening. The Contractor will not be allowed to make changes in the list without the Owner's approval.

The Contractor shall inspect all work performed by subcontractors for compliance with these Contract Documents.

SC – 6.06.J

CONTRACTOR shall pay to each subcontractor engaged in the Project any incremental payments received from the City due to any subcontractor for satisfactory performance of their duties within fifteen (15) days of the Contractor's receipt of the same. Additionally, any and all retainage payment(s) due to a subcontractor by the Contractor shall be paid within fifteen (15) days of the Contractor's retainage payment for the successful completion of the Project.

Upon the Owner's receipt of written notice of the Contractor's failure to promptly pay all subcontractors according to this Contract for work satisfactorily performed at the appropriate stage of completion of the work, the Owner shall initiate an investigation into said allegations. Should said investigation substantiate the allegations charged against the Contractor, the Contractor shall be afforded five (5) working days in which to correct the matter. Failure of the Contractor to correct the matter within said five (5) day period shall result in a financial penalty of Two Hundred Dollars (\$200.00) per day being assessed against the Contractor, retroactive to the date of the first occurrence of the Contractor's failure. Additionally, the amount of the Contractor's cooperation on any contract with City of Chattanooga will be considered in the awarding of any bids on future contracts.

SC - 6.08.B

The Contractor shall obtain the necessary permits for work in the right-of-way of City roads from the City Engineer's office and shall perform all work in accordance with the regulations of that office. If approved by that office, the Contractor will be permitted to close a street when necessary for the proper prosecution of the work. The Contractor shall keep the Police and Fire Departments and ambulance services continuously informed as to his intentions to close streets and give the Police Department sufficient notice in order that "No Parking" signs may be placed at the proper time to clear the street for construction.

The Contractor shall maintain proper barricades and flagmen to detour traffic.

At all times the Contractor is responsible for damage to city and county streets as a result of their use in this project. The streets must be kept clear of all dirt, stone, or other debris. All debris, dirt, etc., whether caused by rains, storms, spillage from trucks, or otherwise, shall be kept out of sewers. The Contractor is responsible for and may not plead ignorance of city and county ordinances and amendments thereto that may affect the use of streets or sewers.

SC – 6.11.E

The Contractor shall protect from damage all property in the vicinity of the work or that is in any way affected by the work, the removal or destruction of which is not called for by the Contract Documents. This applies to public and private property, utility facilities, trees, grass, shrubs, crops, signs, monuments, fences, pipe, underground structures, public roadways, sidewalks, curb and gutters, driveways, and any other natural or man-made terrain features. Whenever such property is damaged due to the Contractor's performance of the work, the Contractor shall immediately restore it to a condition equal to or better than that existing before such damage or injury was done by the Contractor. The Contractor shall make good all such damage or injury in an acceptable manner and at his own expense. The Owner may, upon forty-eight (48) hours notice, proceed to repair, rebuild, or otherwise restore such property as may be deemed necessary, and the cost thereof shall be deducted from any moneys due or which may become due the Contractor under the terms of these Contract Documents.

SC – 6.11.F

Where it is necessary to temporarily interrupt services, the Contractor shall notify the utility owner, both before the interruption and again immediately before service is resumed. Before disconnecting any pipes or cables, the Contractor shall obtain permission from the owners thereof, or shall make suitable arrangements for their disconnection by the owners. Should underground utilities or structures be encountered that are in minor conflict with the alignment or gradient of the proposed work, the proposed work may be adjusted by the Engineer where such adjustment is feasible and will not interfere with the operation of the proposed system. No payment will be made for these adjustments. Where major conflicts in the proposed work and existing utilities or structures occur and adjustment of the new work is not feasible, then the Engineer may revise the alignment and/or grade to suit these conditions. If, in the opinion of the Engineer, these revisions are necessary and are outside the scope of the bid items, they will be paid for as extra work.

SC - 6.11.G

The Contractor shall conduct his operations in a manner that will offer the least possible obstruction and inconvenience to the public, and he shall not have under construction an amount of work greater than he can prosecute properly with due regard to the rights of the public. Construction operations shall be conducted in a manner that will cause as little inconvenience as possible to abutting property owners. Convenient access to driveways, houses, buildings, or other facilities in the vicinity of the work shall be maintained and temporary access facilities for public roadways shall be provided and maintained in satisfactory condition.

SC - 6.11.H

The Contractor shall minimize siltation and erosion during construction and shall conform to all applicable Federal, State, and local erosion control regulations.

SC - 6.13.C

The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards, including sufficient lights and danger signals on or near the work; he shall erect suitable railings, barricades, covers, or other protective devices about unfinished work, open trenches, holes, embankments, or other hazards and obstructions where hazards to workmen or to the public exist. The Contractor shall provide at all times all necessary watchmen on the project for the safety of employees, delivery personnel, and the general public and to diligently guard and protect all work and materials, including Owner-furnished equipment. Construction equipment shall be suitably night-marked and lighted as necessary for safety considerations. No separate payment will be made for providing lights on vehicles and equipment, signs, barricades, lights, flags, watchmen, and other protective devices, and the costs thereof shall be included in the contract prices(s).

SC - 6.13.D

Whenever, in the opinion of the Owner, the Contractor has not taken sufficient precaution for the safety of the public or the protection of the work to be constructed under these Contract Documents or of adjacent structures or property, and whenever, in the opinion of the Owner, an emergency has arisen and immediate action is considered necessary, then the Owner, with or without notice to the Contractor, may provide suitable protection by causing work to be done and material to be furnished and placed. The cost of such work and material shall be borne by the Contractor, and if the same is not paid on presentation of the bills therefor, such cost may be deducted from any amounts due or to become due the Contractor. The performance of such emergency work shall not relieve the Contractor of responsibility for any damage that may occur.

SC - 6.17.A.1

SHOP DRAWINGS: Engineering data covering all equipment and fabricated products to be furnished under these Contract Documents shall be submitted to the Engineer for review. These data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports required; performance characteristics; and dimensions needed for installation and correlation

with other materials and equipment. Data submitted shall include drawings showing essential details of any changes proposed by the Contractor and all required wiring and piping layouts.

SC-6.17.F.2

When the drawings and data are returned marked “NOT APPROVED”, the corrections shall be made as noted thereon and as instructed by the Engineer and resubmitted.

When the drawings and data are returned marked “APPROVED”, fabrication and/or installation can begin and no additional copies need be furnished.

No work shall be performed in connection with the fabrication or manufacture of materials and equipment, nor shall any accessory or appurtenance be purchased until the drawings and data therefor have been reviewed by the Engineer and returned marked “APPROVED” or “APPROVED AS NOTED”.

SC – 6.20.D

INDEMNIFICATION

It is understood and agreed that the Contractor shall be deemed and considered an independent contractor in respect to the work covered by these Contract Documents and shall assume all risks and responsibility for casualties of every description in connection with the work, except that he shall not be held liable or responsible for delays or damage to work caused by acts of God, acts of public enemy, quarantine restrictions, general strikes throughout the trade, or freight embargoes not caused or participated in by the Contractor. The Contractor shall have charge and control of the entire work until completion and final acceptance of the work by the Owner. The Contractor shall be alone liable and responsible for, and shall pay, any and all loss and damages, including attorney's fees, sustained by any person either during the performance or subsequent to the completion of the work covered by these Contract Documents, by reason of injuries to person and damage to property, buildings, and adjacent work, that occur either during the performance or subsequent to the completion of the work covered by these Contract Documents, or that may be sustained as a result or consequence thereof, respective of whether or not such injuries or damage be due to negligence or to the inherent nature of the work. The Contractor shall fully indemnify, protect, defend, and save harmless forever the Owner, the Engineer, and their agents or employees from any and all liability and from all suits and actions of every kind and description brought or which may be brought against them or any of them relative to the performance of the work or other responsibilities of the Contractor under these Contract Documents.

SC - 9 ENGINEER'S STATUS DURING CONSTRUCTION

ADD NEW PARAGRAPHS AS FOLLOWS:

SC - 9.03.B

The Engineer may appoint such RPR's as he may desire. Observation will extend to all parts of the work and to the preparation and manufacture of the materials to be used. An RPR is placed on the work to keep the Engineer and Owner informed as to

the progress of construction and the manner in which it is being done and also to call to the attention of the Contractor any deviation from the Drawings and Specifications.

The RPR's have the authority to reject defective material or work that is being improperly done subject to the final decision of the Engineer. The RPR's are not authorized to revoke, alter, enlarge, or relax the provisions of these conditions, nor are they authorized to approve or accept any portion of the completed work, or to issue instructions contrary to the Drawings and Specifications.

SC - 10 CHANGES IN THE WORK

ADD NEW PARAGRAPHS AS FOLLOWS:

SC - 10.01.C

It is understood and agreed that the Contractor shall perform all extra work that may be ordered in writing by the Engineer acting on the specific authority of the Owner arising out of the modification of the Specifications or Drawings made or approved by the Owner. For this extra work, the Contractor shall be compensated as provided hereinafter and in the Change Order covering the extra work.

Compensation in Change Orders covering extra work shall be based on the unit prices bid in these Contract Documents except where (1) the additional work is of a different character or function and for which no basis of payment is prescribed in these Contract Documents; or (2) the work involves revisions of the details of the work in such manner as to render inequitable payment under items upon which the Contractor bid.

SC - 10.01.D

All Change Orders, including a change in technical design or an increase in cost, must be approved by the Owner the Engineer, and those governmental agencies whose approval is required.

SC - 13 TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

DELETE PARAGRAPH 13.03.D AND SUBSTITUTE THE FOLLOWING:

SC - 13.03.D

All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The testing of materials shall be made by a competent laboratory, agency, or other person selected by the Engineer, approved by, and paid for by the Owner. The Contractor shall be responsible for arranging and obtaining any inspections, testing, or approvals required, and shall submit samples of materials for testing as required by the Engineer. The cost of all retests made necessary by the failure of materials to conform to the requirements of these Contract Documents shall be paid by the Contractor. The cost of making materials, equipment, samples, information, etc., available for determination of source, suitability, applicability, all certified mill tests, etc., shall be included in the contract price for supplying the applicable materials and

equipment as no separate payment will be made for these services. No payment will be made to the Contractor for samples taken for tests such as concrete cylinders, etc.

ADD NEW PARAGRAPHS AS FOLLOWS:

SC - 13.02.G

Where mill tests of materials are found by the Engineer to be acceptable, the Contractor shall furnish certified copies of such mill tests. The cost of furnishing such certified copies shall be borne by the Contractor, with no separate payment allowed.

SC - 14 PAYMENTS TO CONTRACTOR AND COMPLETION

ADD NEW PARAGRAPHS AS FOLLOWS:

SC - 14.02.A.4

On the first day of each month the Contractor may submit to the Engineer, on forms furnished or approved by the Engineer, a progress payment request for the amount of work accomplished, products furnished, and products stored at the site during the previous month. Three (3) signed copies of each request shall be furnished. If requested by Engineer or Owner, or if required by other governmental agencies having jurisdiction over the project, Contractor shall submit payrolls along with the progress payment requests for review. Three (3) signed copies of such payrolls shall be furnished.

SC - 14.02.A.5

The measurements of quantities shall be made by the Engineer in accordance with the Specifications and other Contract Documents.

If the Contract is based on a unit price bid, the items of work to be measured and the units of measurement shall be as set forth in the Bid Proposal Form. Only net quantities of finished work will be measured. Any items of work not set forth in the Bid Proposal Form, but necessary or convenient for the satisfactory completion of the work under the terms of these Contract Documents, shall not be measured separately and shall be considered a part of said items of work set forth in the Bid Proposal Form.

SC - 14.02.A.6

When the Bid Proposal Form contains the provision for receiving bids based on unit prices for various items comprising the complete work, the quantities indicated are approximate only, being given as a basis for comparison of bids. The Owner does not, expressly or by implication, agree that the actual quantity of the items will correspond with the estimated quantity shown in the Bid Proposal Form, and reserves the right to increase or decrease the amount of any item or portion of the work, or to omit portions of the work, as may be deemed necessary or advisable by the Engineer.

SC - 14.02.A.7

It is understood and agreed that the Contractor shall be held responsible for the inclusion of the cost of all incidental items of work necessary or convenient for the

satisfactory completion of the work, in accordance with and within the intent of these Contract Documents, in the price(s) bid and that the prices(s) bid provide for the satisfactory completion of the work specified in these Contract Documents.

SC - 14.02.A.8

No compensation will be made in any case for loss of anticipated profits due to extensions of contract time as a result of delays or other time extensions granted in accordance with Article 12 of the General Conditions.

SC - 14.05.A.3

If Owner requests Contractor to permit the use of any work which Owner believes to be substantially complete or requests to take over operation of any such part of the work although it is not substantially complete, Contractor will issue Contractor's response to such request within ten days and will not cause a delay in the determination of substantial completion status or in finalizing any other requirements provided for in these paragraphs of the General Conditions.

SC - 15 SUSPENSION OF WORK AND TERMINATION

ADD NEW PARAGRAPHS AS FOLLOWS:

SC – 15.01.B

In the event that a suspension of the work is ordered by the Owner, the Contractor shall at his expense do all the work necessary to secure the work and the area affected by the work and to protect all previously completed work as specified herein or as directed by the Owner. The suspension of the work by the Owner shall not relieve the Contractor of any duties, obligations, or responsibilities set forth in these Contract Documents. In the event the Contractor fails to secure and protect the work and area as specified or as ordered, the Owner and/or Engineer will perform, or cause to be performed, all work considered necessary by the Engineer and the cost thereof will be deducted from moneys due or to become due the Contractor under the terms of these Contract Documents

SC - 15.04.B

The Contractor shall not suspend the work and shall not remove any equipment, tools, supplies, materials, or other items without the written permission of the Owner or Engineer.

SC - 16 DISPUTE RESOLUTION

ADD NEW PARAGRAPHS AS FOLLOWS:

SC – 16.01.B

In the event there arises any dispute(s) relative to the Contractor's performance of duties relating to payment of subcontractors for services performed by them in the overall project, Contractors hereby agrees that said dispute(s) shall be settled by binding arbitration as governed by the laws of the State of Tennessee. Contractor further agrees to cooperate in the selection of an arbitrator to hear the matter, and will not unreasonably delay in the selection of said arbitrator. Contractor further

acknowledges that an appeal of any such arbitration decision shall be filed with a court within Hamilton County having appropriate jurisdiction pursuant to Tennessee Uniform Arbitration Act (T.C.A. 29-5-301).

END OF SECTION 00800

SECTION 01020 ALLOWANCES

An allowance in the amount indicated on the Bid Form shall be included for any quantity revisions. Use of allowances shall be authorized in writing by the Engineer and approved by the Owner.

END OF SECTION 01020

SECTION 01740
GUARANTEES AND WARRANTIES

The applicant shall provide this agreement to repair or cause to be repaired at no cost to the Owner any defects in the work, including but not limited to, defective equipment, materials, or supplies, and faulty construction or workmanship, occurring within a period of one (1) year from the date of acceptance indicated in the Notice of Completion. This form shall be completed by the Contractor and submitted to the Owner.

Project: _____

Location: _____

Owner: City of Chattanooga, Tennessee

General Contractor: _____

I (We), _____ do hereby warrant all equipment, materials, products, and workmanship provided in conjunction with the above referenced project from any defects as described above occurring within a period of one (1) year from the date of acceptance of the work indicated in the Notice of Completion.

If, during the warranty period (a) any work, equipment, materials, or products furnished and/or installed are found to be defective in service by reason of faulty construction process, structural and/or mechanical design or specifications, or (b) any equipment, materials, or products furnished and/or installed are found to be defective in material or workmanship, or (c) any portions of the work or materials are damaged in any way whatsoever by other work or activities in the vicinity over which I (we) have direct or indirect responsibility or authority, I (we) shall, as soon as possible after receipt of written notice from the City of Chattanooga, Tennessee or authorized representative, and at no cost to the City, repair or cause to be repaired such defective work, equipment, materials or products, or replace such defective work, equipment, materials or products.

This warranty commences on the acceptance date stipulated in the Notice of Completion of the above referenced project and expires one (1) year from said date.

Signature: _____

Date: _____

NOTARY:

On this _____ day of _____, 200__, before me personally appeared _____ and _____, to me known to be the person(s) described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

IN WITNESS WHERETO, I have hereunto set my hand and Notarial Seal.

NOTARY PUBLIC

My Commission Expires: _____

END OF SECTION 01740

SECTION 02007 - FENCING

PART I - GENERAL

1.01 SCOPE

- A. This section includes providing all materials and labor required for installation of all posts, braces, rails, chain link fabric and gates indicated on the drawings and as here specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete Work, **Section 03300**

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work.

1.04 SUBMITTALS

- A. Submittals shall be made in accord with "SUPPLEMENTAL REQUIREMENTS FOR VENDOR DOCUMENTS/MATERIALS."
- B. The Contractor shall examine the areas to receive chain link fencing and notify Owner of any conditions that may be detrimental to the finished work or may interfere with the timely completion of the work. Beginning work constitutes acceptance of existing conditions and full responsibility of a finished job.

PART II – MATERIALS

- 2.01** Chain link fabric shall be woven into a 2" diamond shape mesh in which the individual pickets are helically woven and interwoven in the form of a continuous chain-like mesh. Salvages shall be knuckled.

- 2.02** Galvanized-after-weaving chain link fabric shall be 11-gauge steel wire. Galvanize in compliance with ASTM A 392, Class II.

2.03 FRAMEWORK

- A. Post, rails, braces and gate frames shall be fabricated of hot dip galvanized steel. Galvanizing shall comply with ASTM A 123.
- B. Line post shall be 1.90-inch diameter Schedule 40 pipe.
- C. Terminal posts 2.375-inch OD, Schedule 40 pipe.
- D. Post tops shall be designed as to exclude moisture from the post.
- E. Top tension wire shall be 7-gauge wire.

SECTION 02007 - FENCING

- F. Gateposts, 2.875-inch OD, Schedule 40 pipe.
- G. Gates. Six foot and fourteen foot leaf width double gates (see plans for width locations), frame formed from 2" OD pipe. Fabric same as fence.

PART III – EXECUTION

3.01 ERECTION

- A. The chain link fence, gates, and accessories shall be installed in strict accordance with plans and specifications in a workmanlike manner.
- B. Encase the posts in concrete as follows: Extend concrete 6" below bottom of posts. Provide 10" diameter encasement for line posts and 12" diameter for end, corner and gateposts. Encasement depth shall be 36" for line posts and 42" for end, corner and gateposts.
- C. After posts are installed and concrete has set firmly, place top tension wire and securely anchor before fabric is hung.
- D. Secure ends of fabric with tension bars threaded through loops in fabric and attach to posts.
- E. Place fabric by securing one end and applying sufficient tension with mechanical fence stretchers to remove slack then attach to top tension wire a 24" on center.
- F. Gates shall be installed plumb and level and all hardware shall be provided for smooth operation.
- G. Clean up. The Contractor shall promptly remove from site all excess material and other debris resulting from fence construction.
- H. Schlage brand padlocks by Contractor; furnish 3 sets of keys to the Owner. All locks to be keyed the same.

END OF SECTION

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PART I - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following utility materials and methods to complement other Division 2 Sections:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Concrete base construction requirements.
 - 3. Equipment nameplate data requirements.
 - 4. Non-shrink grout for equipment installations.
 - 5. Field-fabricated metal and wood equipment supports.
 - 6. Utility piping demolition.
 - 7. Cutting and patching.
 - 8. Touchup painting and finishing.
- B. Pipe and pipe fitting materials are specified in Division 2 piping Sections.
- C. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for excavating, trenching, and backfilling.
 - 2. Division 3 Section "Cast-in-Place Concrete" for bases and thrust restraints.

1.03 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- C. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene.
 - 2. CPVC: Chlorinated polyvinyl chloride.
 - 3. PE: Polyethylene.
 - 4. PVC: Polyvinyl chloride.

1.04 SUBMITTALS

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- A. Product Data: For identification materials and devices.
- B. Samples of color, lettering styles, and other graphic representation required for each identification material and device.
- C. Shop Drawings: Detail fabrication and installation for metal and wood supports, and anchorage for utility piping materials and equipment.
- D. Coordination Drawings: Detail major elements, components, and systems of utility equipment and materials in relation to other systems, installations, and building components. Show space requirements for installation and access. Indicate whether sequence and coordination of installations are important to efficient flow of the Work. Include the following:
 - 1. Planned piping layout, including valve and specialty locations and valve-stem movement.
 - 2. Clearances for installing and maintaining insulation.
 - 3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
 - 4. Equipment and accessory service connections and support details.
 - 5. Building, exterior wall, and foundation penetrations.
 - 6. Sizes and location of required concrete bases.
 - 7. Scheduling, sequencing, movement, and positioning of large equipment during construction.
 - 8. Floor plans, elevations, and details to indicate penetrations in floors and walls, and their relationship to other penetrations and installations.
- E. Welding Certificates: Copies of certificates indicating compliance of welding procedures and personnel with requirements specified in the "Quality Assurance" Article of this Section.

1.05 QUALITY ASSURANCE

- A. Qualify welding processes and operators for structural steel according to AWS D1.1, "Structural Welding Code--Steel."
- B. Qualify welding processes and operators for piping according to the ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions of ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- D. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. If larger equipment is approved,

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no additional costs will be approved for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design requirements and commissioning requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and entrance of dirt, debris, and moisture.
- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.07 SEQUENCING AND SCHEDULING

- A. Coordinate equipment installation with other components.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the Work.
- D. Coordinate connection of piping systems with other exterior underground and overhead utilities and services. Comply with requirements of authorities having jurisdiction, franchised service companies, and controlling agencies.
- E. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces.

PART II - PRODUCTS

2.01 PIPE AND PIPE FITTINGS

- A. Refer to individual Division 2 Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.02 JOINING MATERIALS

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- A. Refer to individual Division 2 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness, unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metal: ASTM B 32.
 - 1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
 - 2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
 - 3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
 - 4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.
 - 5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.20 percent maximum lead content.
- F. Brazing Filler Metals: AWS A5.8.
 - 1. BCuP Series: Copper-phosphorus alloys.
 - 2. BAg1: Silver alloy.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements: Manufacturer's standard solvent cements for the following:
 - 1. ABS Plastic Piping ASTM D 2235.
 - 2. CPVC Plastic Piping: ASTM F 493.
 - 3. PVC Plastic Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 4. ABS to PVC Plastic Piping Transition: ASTM D 3138.
- I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

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- J. Flanged, Ductile-Iron-Pipe Gaskets, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.
 - 2. Followers: **ASTM A 47** (**ASTM A 47M**) malleable iron or ASTM A 536 ductile iron.
 - 3. Gaskets: Rubber.
 - 4. Bolts and Nuts: AWWA C111.
 - 5. Finish: Enamel paint.

2.03 PIPING SPECIALTIES

- A. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and to stop corrosion.
 - 1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types; and matching piping system materials.
 - 2. Insulating Material: Suitable for system fluid, pressure, and temperature.
 - 3. Dielectric Unions: Factory-fabricated union assembly, for **250-psig** (**1725-kPa**) minimum working pressure at **180 degrees F** (**82 degrees C**).
 - 4. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for **150- or 300-psig** (**1035- or 2070-kPa**) minimum working pressure as required to suit system pressures.
 - 5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or PE bolt sleeves, phenolic washers, and steel backing washers.
 - a. Provide separate companion flanges and steel bolts and nuts for **150- or 300-psig** (**1035- or 2070-kPa**) minimum working pressure as required to suit system pressures.
 - 6. Dielectric Couplings: Galvanized-steel coupling; with inert and non-corrosive, thermoplastic lining; threaded ends; and **300-psig** (**2070-kPa**) minimum working pressure at **225 degrees F** (**107 degrees C**).
 - 7. Dielectric Nipples: Electroplated steel nipple; with inert and non-corrosive, thermoplastic lining; plain, threaded, or grooved ends; and **300-psig** (**2070-kPa**) minimum working pressure at **225 degrees F** (**107 degrees C**).
- B. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
 - 1. Steel Sheet Metal: **0.0239-inch** (**0.6-mm**) minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 - 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 - 3. Cast Iron: Cast or fabricated wall pipe equivalent to ductile iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.
 - 4. PVC Plastic: Manufactured, permanent, with nailing flange for attaching to wooden forms.

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5. PVC Plastic Pipe: ASTM D 1785, Schedule 40.
6. PE Plastic: Manufactured, reusable, tapered, cup-shaped, smooth outer surface with nailing flange for attaching to wooden forms.

2.04 IDENTIFYING DEVICES AND LABELS

- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 2 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.
- B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.
 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
 2. Location: An accessible and visible location.
- C. Stencils: Standard stencils, prepared for required applications with letter sizes complying with recommendations of ASME A13.1 for piping and similar applications, but at least **1-1/4-inch- (30-mm-)** high letters for ductwork and at least **3/4-inch- (19-mm-)** high letters for access door signs and similar operational instructions.
 1. Material: Fiberboard.
 2. Material: Brass.
 3. Stencil Paint: Standard exterior-type stenciling enamel; black, unless otherwise indicated; either brushing grade or pressurized spray-can form and grade.
 4. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ASME A13.1 for colors.
- D. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent-adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.
- E. Plastic Duct Markers: Manufacturer's standard color-coded laminated plastic. Comply with the following color-codes:
 1. Green: Cold air.
 2. Yellow: Hot air.
 3. Yellow/Green or Green: Supply air.
 4. Blue: Exhaust, outside, return, and mixed air.
 5. For hazardous exhausts, use colors and designs recommended by ASME A13.1.
 6. Nomenclature: Include the following:
 - a. Direction of airflow.
 - b. Duct service.
 - c. Duct origin.
 - d. Duct destination.
 - e. Design **cubic feet/minute (Liters/second)**.

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- F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine sub-core, unless otherwise indicated.
1. Fabricate in sizes required for message.
 2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
 3. Punch for mechanical fastening.
 4. Thickness: **1/16 inch (1.6 mm)**, unless otherwise indicated.
 5. Thickness: **1/8 inch (3.2 mm)**, unless otherwise indicated.
 6. Thickness: **1/16 inch (1.6 mm)**, for units up to **20 sq. in. (130 sq. cm)** or **8 inches (200 mm)** long; **1/8 inch (3.2 mm)** for larger units.
 7. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
- G. Plastic Equipment Markers: Color-coded laminated plastic. Comply with the following color-codes:
1. Green: Cooling equipment and components.
 2. Yellow: Heating equipment and components.
 3. Yellow/Green: Combination cooling and heating equipment and components.
 4. Brown: Energy reclamation equipment and components.
 5. Blue: Equipment and components that do not meet any criteria above.
 6. For hazardous equipment, use colors and designs recommended by ASME A13.1.
 7. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and revolutions/minute.
 8. Size: Approximate **2-1/2 by 4 inches (65 by 100 mm)** for control devices, dampers, and valves; and **4-1/2 by 6 inches (115 by 150 mm)** for equipment.
- H. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.
1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service.

2.05 GROUT

- A. Non-shrink, Non-metallic Grout: ASTM C 1107, Grade B.

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1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout; non-staining; non-corrosive; non-gaseous; and recommended for interior and exterior applications.
2. Design Mix: 5000 **psig** (34.5 MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART III - EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 2 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping at indicated slopes.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping free of sags and bends.
- F. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- G. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- H. Install fittings for changes in direction and branch connections.
- I. Install couplings according to manufacturer's written instructions.
- J. Sleeves are not required for core drilled holes.
- K. Permanent sleeves are not required for holes formed by PE plastic removable sleeves.
- L. Verify final equipment locations for roughing-in.
- M. Refer to equipment specifications in other Division 2 Sections for roughing-in requirements.
- N. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping Sections:
 1. Remove scale, slag, dirt, and debris from inside and outside pipe and fittings before assembly.

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2. Remove scale, slag, dirt, and debris from inside and outside pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
4. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube."
5. Soldered Joints: Construct joints according to CDA's "Copper Tube Handbook".
6. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
7. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. Damaged Threads: Do not use pipe or pipe fittings with corroded or damaged threads. Do not use pipe sections that have cracked or open welds.
8. Welded Joints: Construct joints according to AWS D10.12, "recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
9. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
10. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
 - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. ABS Plastic Piping: ASTM D 2235 and ASTM D 2661.
 - c. CPVC Plastic Piping: ASTM D 2846 and ASTM F 493.
 - d. PVC Plastic, Pressure Piping: ASTM D 2672.
 - e. PVC Plastic, Non-pressure Piping: ASTM D 2855.
 - f. ABS to PVC Plastic, Non-pressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.
11. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturers' written instructions.

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- a. Plain-End Pipe and Fittings: Use butt fusion.
 - b. Plain-End Pipe and Socket Fittings: Use socket fusion.
- O. Piping Connections: Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.
 - 2. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.02 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- B. Install equipment level and plumb.
- C. Install equipment to facilitate service, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
- D. Install equipment giving right of way to piping systems installed at required slope.

3.03 LABELING AND IDENTIFYING

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 - 1. Stenciled Markers: According to ASME A13.1.
 - 2. Plastic markers, with application systems. Install on insulation segment if required for hot non-insulated piping.
 - 3. Locate pipe markers on exposed piping according to the following:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
 - c. Near locations if pipes pass through walls or floors, or enter inaccessible enclosures.
 - d. At manholes and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.

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- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
 - 1. Lettering Size: Minimum **1/4-inch- (6.35-mm-)** high lettering for name of unit if viewing distance is less than **24 inches (610 mm)**, **1/2 inch (12.7 mm)** high for distances up to **72 inches (1800 mm)**, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
 - 2. Text of Signs: Provide name of identified unit. Include text to distinguish between multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.04 PAINTING AND FINISHING

- A. Refer to Division 9 Section "Painting" for paint materials, surface preparation, and application of paint.
- B. Apply paint to exposed piping according to the following, unless otherwise indicated:
 - 1. Ferrous Piping: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over rust inhibitive metal primer.
 - 2. Galvanized-Steel Piping: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over galvanized metal primer.
 - 3. Ferrous Supports: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over rust-inhibitive metal primer.
- C. Do not paint piping specialties with factory-applied finish.
- D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.05 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than **4 inches (150 mm)** larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use **3000 psig (20.7 MPa)**, 28-day compressive strength concrete and reinforcement as specified in Division 3 Section, "Cast-in-Place Concrete."

3.06 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports in location, alignment, and elevation to support and anchor utility piping materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

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3.07 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor utility materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.08 DEMOLITION

- A. Disconnect, demolish, and remove work specified in Division 2 Sections.
- B. If pipe, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe in its entirety.
- D. Work Abandoned in Place: Cut and remove underground pipe a minimum of **2 inches (50 mm)** beyond face of adjacent construction. Cap and patch surface to match existing finish.
- E. Removal: Remove indicated equipment from Project site.
- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.09 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for utility piping installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.10 GROUTING

- A. Install nonmetallic, non-shrink grout for equipment-support bearing surfaces, pump and other equipment support plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.

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- E. Place grout on concrete bases to provide smooth bearing surface for equipment.
- F. Place grout around anchors.
- G. Cure placed grout according to manufacturers' written instructions.

END OF SECTION 02080

SECTION 02230 – SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation.
3. Clearing and grubbing.
4. Topsoil stripping.
5. Removing above-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place.
7. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
2. Division 2 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and planting.

1.3 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.5 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings according to Division 1 Section "Contract Closeout."

SECTION 02230 – SITE CLEARING

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing 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 authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS (Not Applicable)

2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."
 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

SECTION 02230 – SITE CLEARING

- C. Locate and clearly flag trees and vegetation to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

- A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
 - 1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
 - 2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 - 1. Cover exposed roots with burlap and water regularly.
 - 2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
 - 3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 - 4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.
- D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.
 - 1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
 - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

SECTION 02230 – SITE CLEARING

1. Owner will arrange to shut off indicated utilities when requested by Contractor.
 2. Arrange to shut off indicated utilities with utility companies.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's written permission.
- D. Excavate for and remove underground utilities indicated to be removed.
- E. Removal of underground utilities is included in Division 15 mechanical or Division 16 electrical Sections.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of **18 inches (450 mm)** below exposed subgrade.
 4. Use only hand methods for grubbing within drip line of remaining trees.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding **8-inch (200-mm)** loose depth, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

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1. Limit height of topsoil stockpiles to **72 inches (1800 mm)**.
2. Do not stockpile topsoil within drip line of remaining trees.
3. Dispose of excess topsoil as specified for waste material disposal.
4. Stockpile surplus topsoil and allow for resspreading deeper topsoil.

3.6 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.7 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 02260 - EXCAVATION SUPPORT AND PROTECTION

PART I - GENERAL

- A. Performance Requirements: Design, provide, monitor, and maintain an anchored and braced excavation support and protection system capable of resisting soil and hydrostatic pressure and supporting sidewalls of excavations.
 - 1. System design and calculations must be acceptable to authorities having jurisdiction.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted in writing by the Architect and then only after arranging to provide temporary utility services according to requirements indicated.
- C. Project Site Information: A geotechnical report has been prepared for this Project and is available for information only. The report is not part of the Contract Documents. Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.
 - 1. Make additional test borings and conduct other exploratory operations as necessary.

PART II - PRODUCTS (Not Applicable)

PART III - EXECUTION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
- C. Locate excavation support and protection systems clear of permanent construction and to permit forming and finishing of concrete surfaces.
- D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure excavation support and protection systems remain stable.
- E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.
- F. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures as determined by a registered soils engineer. Remove in stages to avoid disturbing underlying soils and damaging structures, pavements, facilities, and utilities.

SECTION 02260 - EXCAVATION SUPPORT AND PROTECTION

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.

END OF SECTION

SECTION 02270
SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.01 SCOPE

- A. The Contractor shall provide temporary control measures as shown in the plans or as necessary during the life of the Contract to control erosion and water pollution, through the use of berms, dikes, dams, sediment basins, fiber mats, netting, mulches, grasses, slope drains, temporary silt fences, and other control devices.
- B. The temporary pollution control provisions contained herein shall be coordinated with any permanent erosion control features, to assure economical, effective, and continuous erosion control throughout the construction and post-construction period.

PART 2 - PRODUCTS

2.01 TEMPORARY BERMS

- A. A temporary berm is constructed of compacted soil, with or without a shallow ditch, at the top of fill slopes or transverse to centerline on fills.
- B. These berms are used temporarily at the top of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.

2.02 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.

2.03 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.

2.04 CHECK DAMS

- A. Check dams are barriers composed of logs and poles, large stones or other materials placed across a natural or constructed drainway.

- B. Stone check dams shall not be utilized where the drainage area exceeds fifty (50) acres. Log and pole structures shall not be used where the drainage area exceeds five (5) acres.

2.05 TEMPORARY SEEDING AND MULCHING

Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes including waste sites and borrow pits shall be seeded when and where necessary to eliminate erosion.

2.06 BRUSH BARRIERS

- A. Brush barriers shall consist of brush, tree trimmings, shrubs, plants, and other approved refuse from the clearing and grubbing operation.
- B. Brush barriers are placed on natural ground at the bottom of fill slopes, where the most likely erodible areas are located to restrain sedimentation particles.

2.07 BALED HAY OR STRAW CHECKS

- A. Baled hay or straw erosion checks are temporary measures to control erosion and prevent siltation. Bales shall be either hay or straw containing five (5) cubic feet or more of material.
- B. Baled hay or straw checks shall be used where the existing ground slopes toward or away from the embankment along the toe of slopes, in ditches, or other areas where siltation erosion or water run-off is a problem.

2.08 TEMPORARY SILT FENCES

Silt fences are temporary measures utilizing filter fabric and woven wire fence or other approved material. Filter cloth, composed of burlap, plastic filter fabric, etc., is attached to the upstream side of the fence to retain the suspended silt particles in the run-off water.

PART 3 - EXECUTION

3.01 PROJECT REVIEW

Prior to the pre-construction conference the Contractor shall meet with the Engineer and go over in detail the expected problem areas in regard to the erosion control work. Different solutions should be discussed so that the best method might be determined. It is the basic responsibility of the Contractor to develop an erosion control plan and to prevent erosion damage to the project or to adjacent property. Any damage is the responsibility of the Contractor.

3.02 PRE-CONSTRUCTION CONFERENCE

At the pre-construction conference the Contractor shall submit for acceptance his schedule for accomplishment of temporary and permanent erosion control work, as are applicable for clearing and grubbing, grading, bridges and other structures at watercourses, construction, and paving. He shall also submit for acceptance his proposed method of erosion control on haul roads and borrow pits and his plan for disposal of waste materials. No work shall be started until the erosion control schedules and methods of operations have been accepted by the Engineer. Acceptance by the Engineer does not relieve Contractor of responsibility for any erosion damage that may occur.

3.03 CONSTRUCTION REQUIREMENTS

- A. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, the surface of erodible earth material exposed by excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, or other water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded and mulched as the excavation proceeds.
- B. The Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in his accepted schedule. Temporary pollution control measures shall be used to correct conditions that develop during construction that were not foreseen during the design state; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.
- C. Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit, otherwise erosion control measures may be required between successive construction stages.
- D. The Engineer will limit the area of excavation, borrow, and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic,

temporary erosion control measures shall be taken immediately to the extent feasible and justified.

- E. Under no condition shall the amount of surface area or erodible earth material exposed at one time by excavation or fill within the project area exceed 750,000 square feet without prior approval by the Engineer.
- F. The Engineer may increase or decrease the amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions.
- G. In the event of conflict between these requirements and pollution control laws, rules, or regulations or other Federal, State, or Local agencies, the more restrictive laws, rules, or regulations shall apply.

3.04 CONSTRUCTION OF STRUCTURES

A. Temporary Berms

A temporary berm shall be constructed of compacted soil, with a minimum width of 24 inches at the top and a minimum height of 12 inches with or without a shallow ditch, constructed at the top of fill slopes or transverse to centerline on fills. Temporary berms shall be graded so as to drain to a compacted outlet at a slope drain. The area adjacent to the temporary berm in the vicinity of the slope drain must be properly graded to enable this inlet to function efficiently and with minimum ponding in this area. All transverse berms required on the downstream side of a slope drain shall extend across the grade to the highest point at approximately a 10-degree angle with a perpendicular to centerline. The top width of these berms may be wider and the side slope flatter on transverse berms to allow equipment to pass over these berms with minimal disruptions. When practical and until final roadway elevations are approached, embankments should be constructed with a gradual slope to one side of the embankment to permit the placement of temporary berms and slope drains on only one side of the embankment.

B. Temporary Slope Drains

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

3. 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 end 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 and the site restored to match the surroundings.

C. Sediment Structures

1. Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains exit, at the bottom as well as in the ditchlines atop waste sites, and in the ditchlines or borrow pits. Sediment structure may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures shall be at least twice as long as they are wide.
2. When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed, and all excavation backfilled and properly compacted. The existing ground shall be restored to its natural or intended condition.

D. Check Dams

1. Check dams shall be utilized to retard stream flow and catch small sediment loads. Materials utilized to construct check dams are varied and should be clearly illustrated or explained in the Contractor's erosion control plan.
2. All check dams shall be keyed into the sides and bottom of the channel a minimum depth of 2 feet. A design is not needed for check dams but some typical designs are available from the Engineer.

E. Temporary Seeding and Mulching

Seeding and mulching shall be performed in accordance with the section entitled "Seeding."

F. Brush Barriers

Brush barriers shall consist of brush, tree trimmings, shrubs, plants and other approved refuse from the clearing and grubbing operation. The brush barriers

shall be constructed approximately parallel to original ground contour. The brush barrier shall be compressed to an approximate height of 3 to 5 feet and approximate width of 5 to 10 feet. The embankment shall not be supported by the construction of brush barriers.

G. Baled Hay or Straw Erosion Checks

Hay or straw erosion checks shall be embedded in the ground 4 to 6 inches to prevent water flowing under them. The bales shall also be anchored securely to the ground by wooden stakes driven through the bales into the ground. Bales shall be removed after they have served their purpose and the area is stabilized. The Contractor shall keep the checks in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris clean-out will be considered routine maintenance.

H. Temporary Silt Fences

1. 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. Silt fences are constructed of wire mesh fence with a covering of burlap or some other suitable material on the upper side of the fence and anchored into the soil.
2. The Contractor shall be required to maintain the silt fence in a satisfactory condition for the duration of the project or until its removal is requested by the Engineer. The silt accumulation at the fence shall be leveled and seeded upon removal of the fence. The silt fence becomes the property of the Contractor whenever the fence is removed.

3.05 MAINTENANCE

- A. The temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.
- B. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of work as scheduled such work shall be performed by the Contractor at his own expense.
- C. Where the work to be performed is not attributed to the Contractor's negligence, carelessness, or failure to install permanent controls and falls within the Specifications for a work item that has a contract price, the units of work shall be paid for at the proper contract prices.

3.06 EROSION CONTROL OUTSIDE PROJECT AREA

Temporary pollution control shall include construction work outside the project area where such work is necessary as a result of construction such as borrow pit operations, haul roads and equipment storage sites. Bid price in such cases shall include all necessary clearing and grubbing, construction incidentals, maintenance, and site restoration when no longer needed.

END OF SECTION 02270

SECTION 02300 - EARTHWORK

PART I - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for slabs-on-grade.
 - 4. Subbase course for concrete walks and pavements.
 - 5. Base course for asphalt paving.
 - 6. Subsurface drainage backfill for walls and trenches.
 - 7. Excavating and backfilling trenches within building lines.
 - 8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
- B. Related Sections include the following:
 - 1. Division 2 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and plantings.
 - 2. Division 3 Section "Cast-in-Place Concrete" for granular course over vapor retarder.
 - 3. Division 15 and 16 Sections for excavating and backfilling buried mechanical and electrical utilities and buried utility structures.

1.03 DEFINITIONS

- A. Backfill: Soil materials 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: Layer placed between the subbase course and asphalt paving.

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- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations.
 - 1. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated 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. 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.
- I. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.
- J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- K. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.04 SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of plastic warning tape.
 - 2. Separation fabric.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.

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2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

1.05 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: The Geotechnical testing agency will be hired by the Owner. The Contractor shall coordinate testing requirements with the testing agency and provide access to the site.

1.06 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:
 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 2. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART II - PRODUCTS

2.01 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Imported fill soils should consist of low to moderately plastic clay or silt with a plastic index of less than thirty ($PI < 30$). The imported fill should contain no rock fragments larger than 4 inches in any dimension, and should be free from organic matter and other deleterious matter. The on-site soils may be used as engineered fill as approved acceptable by the Owner's Geotechnical testing agency. Existing fill soils will require evaluation by the Owner's Geotechnical testing agency to determine if they can be used as structural fill.
- C. Unsatisfactory Soils: The Geotechnical testing agency observation will determine unsatisfactory soils.
- D. Backfill and Fill: Satisfactory soil materials.
- E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

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- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- I. Drainage Fill: Washed, narrowly graded mixture of 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 0 to 5 percent passing a No. 8 sieve.
- J. 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-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of 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 III - EXECUTION

3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide 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.

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3.02 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.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.03 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.04 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.05 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. 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. 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 for bearing surface.

3.06 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.07 EXCAVATION FOR UTILITY TRENCHES

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

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1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide a working 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 on each side of pipe or conduit.
- C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.08 APPROVAL OF SUBGRADE

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect or Soils Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

3.09 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 may be used when approved by Architect.
 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile 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.

3.11 BACKFILL

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

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1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for record documents.
3. Inspecting and testing underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.

3.12 UTILITY TRENCH BACKFILL

- A. 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.
- B. In areas where trench is under paved areas, backfill remainder of trench with Bedding or Engineered fill to subgrade.
- A. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.
- B. Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- C. Coordinate backfilling with utilities testing.
- D. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. 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 engineered fill.
 4. Under building slabs, use engineered fill.
 5. Under footings and foundations, use engineered fill.

3.14 MOISTURE CONTROL

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- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 3 percent of optimum moisture content.
 - 1. Do not place backfill or fill 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 3 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill 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 materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil 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 material at 98 percent.
 - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 95 percent.
 - 3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from 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 Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1/2 inch..
 - 3. Pavements: Plus or minus 1/2 inch.

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

3.17 SUBSURFACE DRAINAGE

- A. Drainage Piping: Drainage pipe is specified in Division 2 Section "Subdrainage."
- B. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches.
 - 1. Compact each course of filter material to 95 percent of maximum dry unit weight according to ASTM D 698.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least 6 inches.
 - 1. Compact each course of filter material to 95 percent of maximum dry density according to ASTM D 698.

3.18 SUBBASE AND BASE COURSES

- A. Under pavements and walks, place subbase course on prepared subgrade and as follows:
 - 1. Place base course material over subbase.
 - 2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry density according to ASTM D 698.
 - 3. Shape subbase and base to required crown elevations and cross-slope grades.
 - 4. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.
 - 5. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.19 DRAINAGE COURSE

- A. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:
 - 1. Compact drainage course to required cross sections and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 698.
 - 2. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.
 - 3. When compacted thickness of drainage course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

SECTION 02300 - EARTHWORK

3.20 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a Geotechnical engineering firm to perform field quality assurance testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. 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 Engineer.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, 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 each 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 each 150 feet or less of trench length, but no fewer than two tests.
- E. 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 to depth required; recompact and retest until specified compaction is obtained.

3.21 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 the greatest extent possible.

SECTION 02300 - EARTHWORK

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02300

SECTION 02510 - WATER DISTRIBUTION

PART I - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes piping and specialties for potable-water service outside the building.
- B. This Section does not include tapping of utility company water main.
- C. Related Sections include the following:
 - 1. Division 2 Section "Irrigation Work" for irrigation piping.
- D. Connection of irrigation system shall be made to existing baseball field's irrigation man as shown on construction drawings.

1.03 DEFINITIONS

- A. The following are industry abbreviations for plastic and rubber materials:
 - 1. NP: Nylon.
 - 2. PE: Polyethylene.
 - 3. PP: Polypropylene.
 - 4. PTFE: Polytetrafluoroethylene.
 - 5. PVC: Polyvinyl chloride.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressures: The following are minimum pressure requirements for piping and specialties, unless otherwise indicated:
 - 1. Potable-Water Service: 160 psig.

1.05 SUBMITTALS

- A. Product Data: For the following:
 - 1. Water-meter bars.
 - 2. Backflow preventers.
 - 3. Pipe and fittings.
 - 4. Valves.
 - 5. Yard hydrants.
- B. Shop Drawings: For precast concrete structures. Include frames and covers and drains.
- C. Shop Drawings: For cast-in-place concrete structures. Include frames and covers and drains.
- D. Record Drawings: At Project closeout of installed water-service piping according to

SECTION 02510 - WATER DISTRIBUTION

Division 1 Section "Contract Closeout."

- E. Test Reports: As specified in "Field Quality Control" Article in Part 3.
- F. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

1.06 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water-service piping specialties and are based on specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
- B. Comply with standards of authorities having jurisdiction for potable water-service piping. Include materials, installation, testing, and disinfection.
- C. Comply with NSF 61, "Drinking Water System Components--Health Effects," for materials for potable water.
- D. Comply with ASTM F 645, "Guide for Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems."
- E. Provide listing/approval stamp, label, or other marking on piping and specialties made to specified standards.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends and flange faces.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
 - 1. Do not remove end protectors, unless necessary for inspection, then reinstall for storage.
 - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed

SECTION 02510 - WATER DISTRIBUTION

structural capacity of floor when storing inside.

- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.08 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verifies existing utility locations. Contact utility-locating service for area where Project is located.
- B. Verify that water-service piping may be installed to comply with original design and referenced standards.
- C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.09 SEQUENCING AND SCHEDULING

- A. Coordinate connection to water main with utility company.
- B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.
- C. Coordinate with other utility work.

PART II - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Drilling-Machine, Sleeves, and Corporation Stops:
 - a. Ford Meter Box Co., Inc.
 - b. Grinnell Corp, Mueller Company - Water Products Div.
 - c. Lee Brass Co.
 - 2. Bronze Corporation Stops and Valves:
 - a. Ford Meter Box Co., Inc.
 - b. Grinnell Corp.; Mueller Co.; Water Products Div.
 - g. Watts Industries, Inc., James Jones Co.
 - 3. Tapping Sleeves and Valves:
 - a. American Cast Iron Pipe Co.; Waterous Co.
 - b. East Jordan Iron Works, Inc.
 - c. Grinnell Corp.; Mueller Co.; Water Products Div.
 - 4. Gate Valves:
 - b. American Cast Iron Pipe Co.; American Flow Control Div.
 - e. Grinnell Corp.; Grinnell Supply Sales Co.

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- f. Grinnell Corp.; Mueller Co.; Water Products Div.
 - g. Hammond Valve Corp.
- 5. Relief Valves:
 - a. Bermad, Inc.
 - b. GA Industries, Inc.
 - c. MULTIPLEX Manufacturing Co.
- 6. Water-Regulating Valves:
 - a. Ames Co., Inc.
 - c. Cla-Val Co.
 - g. Watts Industries, Inc.; Water Products Div.
- 7. Backflow Preventers:
 - a. Ames Co., Inc.
 - b. Cla-Val Co.
 - f. Watts Industries, Inc - Water Products Div.
- 8. Keyed Couplings:
 - a. McWane, Inc., Tyler Pipe, Gustin-Bacon Div.
 - b. Victaulic Co. of America.
- 9. Protective Enclosures:
 - a. Hot Box.
 - b. HydroCowl, Inc.
- 10. Drains:
 - b. Josam Co.
 - e. Watts Industries, Inc., Ancon Drain Div.
 - f. Zurn Industries, Inc.- Hydromechanics Div.
- 11. Sanitary-Type Yard Hydrants:
 - a. Murdock, Inc.
- 12. Post-Type Yard Hydrants:
 - a. Josam Co.
 - d. Watts Industries, Inc.- Ancon Drain Div.
 - f. Zurn Industries, Inc.- Hydromechanics Div.

2.02 PIPES AND TUBES

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. Copper Tube: ASTM B 88, seamless water tube, annealed temper.
- E. PE Plastic Pipe: ASTM D 2239, of PE compound and with SIDR required for 160-psig minimum pressure rating. Include marking "NSF-pw" according to NSF 14.
- F. PVC Plastic Pipe: ASTM D 1784, Grade 1, Type I, Class 12454-B.

2.03 PIPE AND TUBE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
- B. Copper Fittings: ASME B16.22; wrought-copper, solder-joint pressure type.

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- C. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300, as required for system operating pressure.
- D. Cast-Iron Flanged Fittings: ASME B16.1, Class 125, unless otherwise indicated.
- E. Fittings for PE Plastic Pipe: ASTM D 2609, insert type, made of NP, PP, or PVC plastic; with male, serrated ends matching inside of pipe or threaded ends, as required. Include corrosion-resistant bands or crimp rings.
- F. PVC Plastic, Socket Fittings: ASTM D 2466, Schedule 40.
- G. PVC Plastic Fittings: UL 1285 and AWWA C907, Class 150. Include elastomeric seals according to ASTM F 477.

2.04 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Refer to Division 2 Section "Utility Materials" for commonly used joining materials.
- C. Ductile-Iron Piping: The following materials apply:
 - 1. Push-on Joints: AWWA C111 rubber gaskets and lubricant.
 - 2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
 - 3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.
 - a. Gaskets: Rubber, flat face, 1/8 inch thick, unless otherwise indicated and full-face or ring type, unless otherwise indicated.
 - b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Brazing Filler Metals: AWS A5.8, BCuP Series.
- E. Solder Filler Metal: ASTM B 32, Alloy Sn95, Alloy Sn94, or Alloy E, with 0.10 percent maximum lead content.
- F. Primers for PVC Piping Solvent-Cement Joints: ASTM F 656.
- G. Solvent Cement for PVC Piping Solvent-Cement Joints: ASTM D 2564.
- H. Pipe Couplings: Iron-body sleeve assembly, fabricated to match OD of pipes to be joined.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.
 - 2. Followers: ASTM A 47, malleable iron; or ASTM A 536, ductile iron.
 - 3. Gaskets: Rubber.
 - 4. Bolts and Nuts: AWWA C111.
 - 5. Finish: Enamel paint.
- I. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

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2.05 PIPING SPECIALTIES

- A. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.
 - 1. Description: Combination of copper alloy and ferrous threaded, solder, plain, and weld-neck end types and matching piping system materials.
 - 2. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.
 - 3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum pressure to suit system pressures.
 - 4. Dielectric Couplings: Galvanized-steel couplings with inert and non-corrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F.
 - 5. Dielectric Nipples: Electroplated steel nipples with inert and non-corrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig working pressure at 225 deg F.

2.06 VALVES

- A. Non-rising Stem, Metal-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C500, gray- or ductile-iron body and bonnet; with cast-iron or bronze, double-disc gate, bronze gate rings, bronze stem, and stem nut. Include 200-psig minimum working-pressure design; interior coating according to AWWA C550; and mechanical-joint ends, unless otherwise indicated.
- B. Non-rising Stem, Resilient-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig minimum working-pressure design, interior coating according to AWWA C550, and push-on- or mechanical-joint ends.
- C. Valve Boxes: Cast-iron box with top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
 - 1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.
- D. Curb Stops: Bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet to match service piping material.
- E. Service Boxes for Curb Stops: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover with lettering "WATER," and bottom section with base of size to fit over curb-stop and barrel approximately 3 inches in diameter.
 - 1. Provide steel tee-handle shutoff rod with each service box. Include tee handle with one pointed end, stem of length to operate curb stop, and slotted end fitting

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curb-stop head.

- F. Service Clamps and Corporation Stops: Complete assembly, including service clamp, corporation stop, and bolts and nuts. Include service clamp and stop compatible with drilling machine.
 - 1. Service Clamp: Cast iron or ductile iron with gasket and AWWA C800 threaded outlet for corporation stop, and threaded end straps.
 - 2. Corporation Stops: Bronze body and ground-key plug, with AWWA C800 threaded inlet and outlet matching service-piping material.
 - 3. Manifold: Copper with 2 to 4 inlets as required, with ends matching corporation stops and outlet matching service piping.
- G. Ball Valves AWWA C507, Class 250. Include interior coating according to AWWA C550.
- H. Butterfly Valves: UL 1091, with 175-psig working-pressure rating.
- I. Check Valves UL 312, with swing clapper and 175-psig working-pressure rating.

2.07 SPECIALTY VALVES

- A. Air-Release Valve AWWA C512, hydromechanical device to automatically release accumulated air. Include 300-psig working-pressure design.

2.08 WATER-METER BOXES

- A. Description: Cast-iron body and cover for disc-type water meter. Include lettering "WATER METER" in cover; and slotted, open-bottom base section of length to fit over service piping.
 - 1. Option: Base section may be cast-iron, PVC plastic, clay or other pipe.

2.09 BACKFLOW PREVENTERS

- A. General: Manufactured backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.
- B. Working Pressure: 150 psig minimum, unless otherwise indicated.
- C. 2-Inch NPS and Smaller: Bronze body with threaded ends.
- D. 2-1/2-Inch NPS and Larger: Bronze, cast-iron, steel, or stainless steel body with flanged ends.
- E. Interior Lining: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.
- F. Interior Components: Corrosion-resistant materials.
- G. Strainer on inlet if strainer is indicated.
- H. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with non-removable

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and manual drain features, and ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

- I. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous-pressure application.
 - 1. Pressure Loss: 12 psig maximum through middle third of flow range.
- J. Antisiphon, Pressure-Type Vacuum Breakers: ASSE 1020, with valves, spring-loaded check valve, and spring-loaded floating disc. Include test cocks and atmospheric vent for continuous-pressure application.
 - 1. Pressure Loss: 5 psig maximum through middle third of flow range.

2.10 ANCHORAGES

- A. Clamps, Straps, and Washers: ASTM A 506, steel.
- B. Rods: ASTM A 575, steel.
- C. Rod Couplings: ASTM A 197, malleable iron.
- D. Bolts: ASTM A 307, steel.
- E. Cast-Iron Washers: ASTM A 126, gray iron.
- F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psig.
 - 1. Cement: ASTM C 150, Type I.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.

2.11 IDENTIFICATION

- A. Refer to Division 2 Section "Earthwork" for underground warning tape materials.
- B. Arrange for detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."
- C. Nonmetallic Piping Label: Engraved, plastic-laminate label at least 1 by 3 inches, with caption "CAUTION--THIS STRUCTURE HAS NONMETALLIC WATER-SERVICE PIPING," for installation on main electrical meter panel.

PART III - EXECUTION

3.01 EARTHWORK

- A. Refer to Division 2 Section "Earthwork" for excavation, trenching, and backfilling.
- B. Refer to Division 2 Section "Hot-Mix Asphalt Paving" for cutting and patching of

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existing paving.

- C. Refer to Division 2 Section "Portland Cement Concrete Paving" for cutting and patching of paving.

3.02 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:
- B. Potable Water-Service Piping: Use the following:
 - 1. 3/4- to 2-Inch NPS: Copper tube, Type K; copper fittings; and soldered joints.
 - 2. 3/4- to 2-Inch NPS: Copper tube, Type K; copper fittings; and brazed joints.
 - 3. 3/4- to 2-Inch NPS: PE plastic pipe; molded PE plastic fittings; and heat-fusion joints.
 - 4. Option for 2-1/2- to 3-1/2-Inch NPS: 3- or 4-inch NPS; ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
 - 5. 2-1/2- to 3-1/2-Inch NPS: Copper tube, Type K; copper fittings; and brazed joints.

3.03 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Underground Valves, 3-Inch NPS and Larger: AWWA, gate valves, non-rising stem, with valve box.
 - 2. Underground Valves, 4-Inch NPS and Larger: UL/FM, gate valves, non-rising stem, with indicator post.
 - 3. Pit and Aboveground Installation Valves, 3-Inch NPS and Larger: AWWA, OS&Y gate valves.
 - 4. Pit and Aboveground Installation Valves, 2-1/2-Inch NPS and Larger: UL/FM, OS&Y gate valves.
 - 5. Pit and Aboveground Installation Valves, 2-Inch NPS and Smaller: MSS, non-rising stem gate valves.

3.04 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- B. Install piping at indicated slope.
- C. Install components with pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.
- E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

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- F. Install fittings for changes in direction and branch connections.
- G. Piping Connections: Unless otherwise indicated, make piping connections as specified below:
 - 1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
 - 2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 - 3. Install dielectric fittings to connect piping of dissimilar metals.

3.05 SERVICE ENTRANCE PIPING

- A. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.
 - 1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water-piping systems when those systems are installed.
- B. Sleeves and mechanical sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- C. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.06 PIPING INSTALLATION

- A. Water-Main Connection: Arrange for tap in water main, of size and in location indicated, from water utility.
- B. Make connections larger than 2-inch NPS with tapping machine according to the following:
 - 1. Install tapping sleeve and tapping valve according to manufacturers written instructions.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
 - 4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
- C. Make connections, 2-inch NPS and smaller, with drilling machine according to the following:
 - 1. Install service clamps and corporation stops in size, quantity, and arrangement required by utility company standards and according to manufacturer's written instructions.
- D. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

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- E. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
 - 1. Under Driveways: With at least 36 inches cover over top.
 - 2. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.
- F. Install piping under streets and other obstructions that cannot be disturbed, by tunneling, jacking, or combination of both.

3.07 ANCHORAGE INSTALLATION

- A. Install anchorage for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorage for the following piping systems:
 - 1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.
 - 2. Gasketed-Joint, PVC Potable-Water Piping: According to AWWA M23.
- B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.08 VALVE INSTALLATION

- A. General Application: Use mechanical-joint-end valves for 3-inch NPS and larger underground installation. Use threaded- and flanged-end valves for installation in pits. Use non-rising stem UL/FM gate valves for installation with indicator posts. Use bronze corporation stops and valves, with ends compatible with piping, for 2-inch NPS and smaller installation.
- B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.
- C. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.
- D. Bronze Corporation Stops and Curb Stops: Comply with manufacturer's written instructions. Install underground curb stops with head pointed up and with cast-iron curb box.

3.09 IDENTIFICATION INSTALLATION

- A. Install continuous plastic underground warning tape during back filling of trench for underground water-service piping. Locate 6 to 8 inches below finished grade, directly over piping.
- B. Attach nonmetallic piping label permanently to main electrical meter panel.

3.10 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

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1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.

C. Prepare reports for testing activities.

3.11 CLEANING

A. Clean and disinfect water distribution piping as follows:

1. Purge new water distribution piping and parts of existing piping that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
 - c. After allowed standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports for purging and disinfecting activities.

END OF SECTION 02510

SECTION 02512 – SUB-GRADE AND BASE COURSE PREPARATION

PART I – GENERAL

1.01 WORK INCLUDED

- A. Sub-grade preparation.
- B. Crushed stone or crushed gravel compacted base course.

1.02 RELATED WORK

- A. Section 02514 – Portland Cement Concrete Paving
- B. Section 02511 – Hot Mix Asphalt Paving

1.03 REFERENCES

- A. Where Tennessee Department of Transportation Specifications for road and Bridge construction are referred to, the applicable requirements of that Section shall be considered a part of these specifications and all materials and construction methods prescribed therein shall be as binding as if herein specified. The Sections referred to are from Tennessee, current edition with latest supplements.

PART II – PRODUCTS

2.01 MATERIALS

- A. Base Courses: Comply with Tennessee Department of Transportation specifications, Section 303, Class A.

PART III – EXECUTION

3.01 SUB-GRADE PREPARATION

- A. Grade sub-grade to lines and grades indicated. Preparation of sub-grade shall be in compliance with Tennessee D.O.T. Specifications sections referenced herein.

SECTION 02512 – SUB-GRADE AND BASE COURSE PREPARATION

3.02 BASE COURSE

- A. Construct crushed stone or crushed gravel base course to thickness indicated on drawings and in compliance with Tennessee D.O.T. Specifications, Section 303, Class A.
- B. All areas to receive paving shall be graded to the indicated sub-grade elevation and proof-rolled as outlined below.
- C. All areas (sub-grade) to receive compacted fill, pavements or slabs on grade shall be proof-rolled in the presence of the Owner's Representative or Testing Agency to detect any soft areas that may exist. A four-wheeled, pneumatic-tired roller of not less than 25 tons, or its equivalent, shall be used for this operation. At least four passes shall be made, two in each of two directions at right angles. Any soft areas thus disclosed shall be stabilized or undercut and replaced with properly compacted material as approved by the Owner's Representative or Testing Agency.
- D. Proof-rolling should be conducted only on soils in their approximate natural moisture condition. Proof-rolling should not be undertaken after rains while soils are still in a high moisture condition (well above the natural moisture content) or on soils which are desiccated by prolonged drying.

END OF SECTION

SECTION 02514 – PORTLAND CEMENT CONCRETE PAVING

PART I – GENERAL

1.01 WORK INCLUDED

- A. Concrete sidewalks, roads, aprons, door pads, curbs and gutters.
- B. Reinforcement.
- C. Surface finish.
- D. Curing.

1.02 RELATED WORK

- A. Section 02512 - Sub-grade and Base Course Preparation
- B. Section 02764 - Pavement Joint Sealants
- C. Section 02300 – Earthwork
- D. Division 3 Section “Cast-in-Place Concrete”

1.03 REFERENCES

- A. ACI 211.1 - Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete.
- B. ACI 211.2 - Recommended practice for Selecting Proportions for Structural Lightweight Concrete.
- C. ACI 301 - Specifications for Structural Concrete for Buildings.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
- E. ACI 305R - Hot Weather Concreting.
- F. ACI 306R - Cold Weather Concreting.
- G. ACI 315 - Details and Detailing of Concrete Reinforcement.
- H. ACI 318 - Building Code Requirements for Reinforced Concrete.
- I. ACI 347 - Recommended Practice for Concrete Formwork, Concrete Reinforcing Steel Institute, Manual of Standard Practice.
- J. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- K. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

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- L. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
- M. ASTM C31 - Standard Method of Making and Curing Concrete Test Specimens in the Field.
- N. ASTM C33 - Standard Specification for Concrete Aggregates.
- O. ASTM C39 - Standard Test Method of Compressive Strength of Cylindrical Concrete Specimens.
- P. ASTM C78 - Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
- Q. ASTM C94 - Ready Mixed Concrete.
- R. ASTM C143 - Slump of Portland Cement Concrete.
- S. ASTM C150 - Portland Cement.
- T. ASTM C172 - Sampling Fresh Concrete.
- U. ASTM C173 - Air Content of Freshly Mixed Concrete by the Volumetric Method.
- V. ASTM C192 - Making and Curing Concrete Test Specimens in the Laboratory.
- W. ASTM C231 - Air Content Of Freshly Mixed Concrete by the Pressure Method.
- X. ASTM C260 - Air-Entraining Admixtures for Concrete.
- Y. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- Z. ASTM C494 - Chemical Admixtures for Concrete.
- AA. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- BB. ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- CC. Tennessee Department of Transportation – Standard Specifications for Road and Bridge Construction.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain materials from same source throughout.
- C. Submit laboratory test reports for concrete materials and mix design test as specified.

SECTION 02514 – PORTLAND CEMENT CONCRETE PAVING

- D. Provide material certificates in lieu of materials laboratory test reports when permitted by Owner's Representative. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item meets specified requirements.

1.05 TESTS

- A. As the work progresses, sample concrete in accordance with ASTM C172.
- B. Make slump tests according to ASTM C143, one slump test for each set of test cylinders.
- C. Test air content of concrete made with normal-weight aggregates having low water absorption according to either ASTM C231 or ASTM C173. For lightweight aggregates or aggregates with high absorptions, use latter test method.
- D. Make compression test specimens and cure according to ASTM C31. Each test shall consist of one set of laboratory cured cylinders. A set shall consist of four cylinders. Minimum number of tests shall be one for 100 cubic yards of concrete for each class. Make at least one test per day of each class of concrete used that day.
- E. Cure specimens under laboratory conditions. Specimens cured under job conditions may be required when, in Owner's Representative's opinion, there is a possibility of the surrounding air temperature falling below 40°F, or rising above 90°F.
- F. Test cylinders according to ASTM C39.
- G. Test laboratory cured cylinders one at seven days, two at 28 days, and one at 56 days, if required.
- H. Strength level of concrete will be considered satisfactory if averages of any three consecutive strength test results of laboratory cured cylinders equal or exceed specified strength f'_c , and no individual strength test result falls below specified strength f'_c by more than 500 psi.
- I. Make reports on cylinder tests to Owner's Representative and show dates placed and tested, name of job, proportions of cement and aggregate, quantity of water, slump, air content, admixtures, location of concrete in the project, type of concrete, compressive strength in pounds per square inch and atmospheric and concrete temperature at time of sampling.
- J. In cases where strength of laboratory cured cylinders shown by tests for any portion of paving falls below required compressive strengths specified, Owner's Representative shall have the right to order change in mix or in cement content for remaining portion of the paving.
- K. Make and cure flexural test beam specimens according to ASTM C78. Each test shall consist of one set of laboratory cured beams. A set shall consist of two

SECTION 02514 – PORTLAND CEMENT CONCRETE PAVING

beams. Minimum number of tests shall be one for each 100 cubic yards of concrete placed, at least one per day. Cure specimens under laboratory conditions.

- L. Test beams according to ASTM C78, simple beam with third-point loading. Test beams shall have six inch by six inch cross-section.
- M. Test beams at 14 days.
- N. Flexural strength level of concrete shall be considered satisfactory as long as averages of any three consecutive test results of laboratory cured beams equal or exceed specified strength, and no individual strength test result falls below specified strength by more than 100 psi.
- O. Concrete cylinder and flexural tests shall be made by an independent testing laboratory selected by Owner. Cost of initial tests shall be paid for by Owner. Subsequent tests required as a result of improper strength shall be paid for by Contractor.

PART II – MATERIALS

2.01 CONCRETE MATERIALS

- A. Cement: ASTM C150, Normal-Type I, gray color.
- B. Fine and Coarse Aggregates: ASTM C33. Provide aggregates from single source for exposed concrete.
 - 1. For grading tests of fine and coarse aggregates, use square mesh wire cloth complying with ASTM E11.
 - 2. Fine Aggregate:
 - a. Provide washed natural sand of strong, hard durable particles.
 - b. Grade from coarse to fine within following limits:

Sieve Size	Percentage by Weight Passing Sieve	
	Minimum	Maximum
3/8"	100	---
No. 4	95	100
No. 8	65	95
No. 16	45	75
No. 30	30	50
No. 50	10	22
No. 100	2	8

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3. Coarse Aggregate:

- a. Provide coarse aggregate consisting of clean, hard, fine-grained, sound crushed rock or washed gravel, or combination of both.
- b. Any piece having length in excess of five times average thickness shall be considered flat or elongated.
- c. The maximum size coarse aggregate shall 1½ " with the minimum size being 1 inch.
- d. Grade combined aggregates within following limits:

Sieve Size or Percentage by Weight Passing Sieve				
Size in Inches	1½" Aggregate		1" Aggregate	
	<u>Min.</u>	<u>Max.</u>	<u>Min.</u>	<u>Max</u>
1½"	95	---	---	---
1"	75	90	90	100
¾"	55	77	70	90
3/8"	40	55	45	65
No. 4	30	0	31	7
No. 8	22	35	23	40
No. 16	16	30	17	35
No. 30	0	20	10	23
No. 50	2	8	2	10
No. 100	0	3	0	3

- e. Water: Clean, not detrimental to concrete, and conforming to ACI 318, Article 3.4.
- f. Form Materials.
 1. Conform to ACI 301.

C. Reinforcement

1. Reinforcing Steel: ASTM A615; 60 ksi yield grade; deformed billet steel bars.
2. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; uncoated finish.
3. Tie Wire: Annealed steel, minimum 16 gauge size.
4. Dowels: ASTM A615; 40 ksi yield grade, plain steel, uncoated finish.

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D. Accessories

1. Curing Compound: FS TT-C-800, Type 1, 30% solids; ASTM C309, Kurey DR, manufactured by Euclid Chemical Company and L&M Cure Resin by L&M Construction Materials, or approved equal.
2. Expansion Joint Filler: Non-extruding, non-bituminous, resilient type complying with AASHTO M153 and ASTM D1752.
3. Joint Sealant for Pavements Unless Noted Otherwise on Drawings: Urethane complying with ASTM D1850 and ASTM C290 such as "Urexpan NR-200" by Pecora Corp., "VULKEM-245" by Mameco International, or approved equal.

E. Admixtures

1. Air Entrainment: Conform to ASTM C260.
2. Water Reducing Admixture: Conform to ASTM C494, Type A, containing not more than 1% chloride ions.
3. High Range Water Reducing Admixture (Super Plasticizer): Conform to ASTM C494, Type F or G, containing not more than 1% chloride ions.
4. Non-Chloride Accelerator Admixture: Conform to ASTM C494, Type C or E. Provide long-term test data proving non-corrosive effect on reinforcing steel.

F. Concrete Mix Design

1. Design concrete for flexural strength of 650 pounds per square inch at 14 days, compressive strength of (f'c) of 4,500 pounds per square inch at 28 days.
2. Unless otherwise noted, concrete shall have minimum cement content of 517 pounds per cubic yard of concrete and maximum water content not exceeding 28.0 gallons per cubic yard.
3. Concrete shall contain no calcium chloride nor shall admixtures contain more than 1 % chloride ions or air entraining cement, unless approved by Owner's Representative.
4. Concrete shall be air entrained and conform to air content limits of Table 1 below.

Table 1 – Air Content for Air-Entrained Concrete	
Maximum Size Coarse Aggregate Inches	Air Content Percent by Volume
1	5.5±1
1 ½"	5.0±1

SECTION 02514 – PORTLAND CEMENT CONCRETE PAVING

5. Concrete shall have maximum water-cement ratio of 0.45.
6. Concrete shall have a slump of 3", plus or minus ½".
7. Methods of measuring concrete materials shall be such that proportions can be accurately controlled and easily checked. Measurement of materials for ready-mixed concrete shall conform to ASTM C94.
8. Use accelerating admixtures in cold weather only when approved by Owner's Representative. Use of admixtures will not relax cold weather placement requirements.
9. Use set-retarding admixtures during hot weather only when approved by Owner's Representative.

PART III – EXECUTION

3.01 INSPECTION

- A. Verify compacted subgrade ready to support paving and imposed loads.
- B. Verify correct gradients and elevations of base.
- C. Beginning installation implies acceptance of existing conditions.

3.02 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Notify Owner's Representative minimum 24 hours before start of concreting operations.

3.03 FORMING

- A. Place and secure forms to correct location, dimension, and profile.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 REINFORCEMENT

- A. Where noted on drawings, reinforce concrete paving with welded steel wire fabric.
- B. Provide chairs, supports, spacers, bolsters and other devices to keep reinforcement at proper elevations and in place.
- C. Interrupt reinforcement at control, contraction and expansion joints.

SECTION 02514 – PORTLAND CEMENT CONCRETE PAVING

3.05 FORMED JOINTS

- A. Place joints as shown on plans to correct elevation and profile.

3.06 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Hot Weather Placement: ACI 305R
- C. Cold Weather Placement: ACI 306R
- D. Ensure reinforcements, inserts, embedded parts, formed joints and are not disturbed during concrete placement.
- E. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- F. Place concrete to pattern indicated. Saw cut contraction joints at an optimum time after finishing. Saw joints in accordance with details on plans.
- G. Chamfer exposed corners of concrete using wood, metal, PVC, or rubber chamfer strips fabricated to produce smooth lines and tight edge strips.

3.07 FINISHING

- A. Road and Apron Paving: Light broom.
- B. Sidewalk Paving: Light broom and trowel joint edges.
- C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.08 FIELD QUALITY CONTROL

- A. Field testing will be performed by an independent testing company as selected by the Owner.
- B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.09 PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

SECTION 02630 - STORM DRAINAGE

PART I - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes storm drainage outside the building.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for concrete structures.

1.03 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. PE or HDPE: Polyethylene plastic, or High Density Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. CMP: Corrugated Metal Pipe
- F. RCP: Reinforced Concrete Pipe

1.04 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.05 SUBMITTALS

- A. Shop Drawings: Include plans, elevations, details, and attachments for the following:
 - 1. Precast concrete manholes and other structures, including frames, covers, and grates.
 - 2. Cast-in-place concrete manholes and other structures, including frames, covers, and grates.
- B. Design Mix Reports and Calculations: For each class of cast-in-place concrete.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.

SECTION 02630 - STORM DRAINAGE

- C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.07 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without owner's written permission.

PART II - PRODUCTS

2.02 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.03 PIPES AND FITTINGS

- A. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A 74, gray iron, for gasketed joints.
 - 1. Gaskets: ASTM C 564, rubber, compression type, thickness to match class of pipe.
- B. Hubless Cast-Iron Soil Pipe and Fittings: CISPI 301 or ASTM A 888, gray iron, for coupling joints.
 - 1. Cast-Iron, Heavy-Duty Couplings: ASTM C 1277, assembly with housing of gray iron complying with ASTM A 48, stainless-steel bolts, and rubber sealing gasket complying with ASTM C 564.
- C. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.
 - 1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
 - 2. Gaskets: AWWA C111, rubber.
- D. Ductile-Iron Culvert Pipe: ASTM A 716, for push-on joints.
 - 1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
 - 2. Gaskets: AWWA C111, rubber.
- E. Corrugated-Steel Pipe: ASTM A 760/A 760M, Type I, made from ASTM A 929/A 929M, zinc-coated steel sheet for banded joints.
 - 1. Fittings: Fabricated to types indicated and according to same standards as pipe.

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2. Connecting Bands: Standard couplings made for corrugated-steel pipe to form soiltight joints.
- F. Corrugated-Aluminum Pipe: ASTM B 745/B 745M, Type I, made from ASTM B 744/B 744M, aluminum-alloy sheet for banded joints.
1. Fittings: Fabricated to types indicated and according to same standards as pipe.
 2. Connecting Bands: Standard couplings made for corrugated-aluminum pipe to form soiltight joints.
- G. Corrugated PE or HDPE Pipe and Fittings: ASTM F 405, ASTM F 667, AASHTO M 252, and AASHTO M 294.
1. Soiltight Couplings: ASTM F 405, ASTM F 667, AASHTO M 252, and AASHTO M 294, corrugated, matching pipe and fittings to form soiltight joints.
- H. PVC Sewer Pipe and Fittings: According to the following:
1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.
 - a. Gaskets: ASTM F 477, elastomeric seals.
 2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.
 - a. Gaskets: ASTM F 477, elastomeric seals.
- I. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Class III, Wall B, for gasketed joints.
1. Gaskets: ASTM C 443, rubber.

2.04 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.
1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.
 2. Sleeve Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
 3. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
 4. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
- B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for nonpressure joints.
1. Material for Concrete Pipe: ASTM C 443, rubber.
 2. Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
 3. Material for Plastic Pipe: ASTM F 477, elastomeric seal.
 4. Material for Dissimilar Pipe: Compatible with pipe materials being joined.
- C. Ductile-Iron Expansion Joints: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated. Include PE film, pipe encasement.

2.05 MANHOLES

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- A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
1. Diameter: 48 inches minimum, unless otherwise indicated.
 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
 5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 6. Gaskets: ASTM C 443, rubber.
 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
 8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
 2. Gaskets: Rubber.
 3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
 4. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Ballast: Increase thickness of concrete, as required to prevent flotation.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.

SECTION 02630 - STORM DRAINAGE

- D. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

2.06 CATCH BASINS

- A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
 - 1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 - 2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
 - 3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 - 4. Gaskets: ASTM C 443, rubber.
 - 5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
 - 6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
 - 7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Heavy-Traffic, Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
 - 1. Gaskets: Rubber.
 - 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
 - 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
 - 4. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.
 - 1. Bottom, Walls, and Top: Reinforced concrete.
 - 2. Channels and Benches: Concrete.
 - 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
- D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include flat grate with small square or short-slotted drainage openings.

SECTION 02630 - STORM DRAINAGE

1. Size: 24 by 24 inches minimum, unless otherwise indicated.
 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.
- E. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.
1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.07 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.
- B. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- C. Frames and Grates: Heavy-duty frames and grates according to utility standards.

2.08 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
- C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious ratio.
1. Include channels and benches in manholes.
 - a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - 1) Invert Slope: 1 percent through manhole.
 - b. Benches: Concrete, sloped to drain into channel.
 - 1) Slope: 4 percent.
 2. Include channels in catch basins.
 - a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - 1) Invert Slope: 1 percent through catch basin.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

SECTION 02630 - STORM DRAINAGE

PART III - EXECUTION

3.01 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.02 PIPING APPLICATIONS

- A. General: Include watertight, silttight, or soiltight joints, unless watertight or silttight joints are indicated.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.
- C. Gravity-Flow Piping: Use the following:
 - 1. NPS 3: Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. NPS 3: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and
 - 3. NPS 4 to NPS 6: Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 4. NPS 4 to NPS 6: Hubless cast-iron soil pipe and fittings, couplings, and coupled joints.
 - 5. NPS 4 and NPS 6: Corrugated-steel pipe and fittings, connecting bands, and banded joints.
 - 6. NPS 4 and NPS 6: Corrugated PE drainage tubing and fittings, soiltight couplings, and coupled joints.
 - 7. NPS 4 and NPS 6: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
 - 8. NPS 8 to NPS 15: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints in NPS 8 to NPS 12. Use ductile-iron culvert pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints in NPS 14 to NPS 16.
 - 9. NPS 8 to NPS 15: Corrugated-steel pipe and fittings, connecting bands, and banded joints.
 - 10. NPS 8 to NPS 15: Corrugated-aluminum pipe and fittings, connecting bands, and banded joints.
 - 11. NPS 8 to NPS 15: Corrugated PE drainage tubing and fittings, soiltight couplings, and coupled joints in NPS 8 and NPS 10. Use corrugated PE pipe and fittings, soiltight couplings, and coupled joints in NPS 12 and NPS 15.
 - 12. NPS 8 to NPS 15: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
 - 13. NPS 8 to NPS 15: NPS 12 and NPS 15 reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints. Do not use nonreinforced pipe instead of reinforced concrete pipe in NPS 8 and NPS 10.
 - 14. NPS 18 to NPS 36: Corrugated-steel pipe and fittings, connecting bands, and banded joints.
 - 15. NPS 18 to NPS 36: Corrugated-aluminum pipe and fittings, connecting bands, and banded joints.

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16. NPS 18 to NPS 36: Corrugated PE pipe and fittings; corrugated, soiltight couplings; and coupled joints.
17. NPS 18 to NPS 36: Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.
18. NPS 42 to NPS 120: Corrugated-steel pipe and fittings, connecting bands, and banded joints.
19. NPS 42 to NPS 120: Corrugated-aluminum pipe and fittings; connecting bands; and banded joints.
20. NPS 42 and NPS 48: Similar pattern to corrugated PE pipe and fittings; corrugated, soiltight couplings; and coupled joints.
21. NPS 42 to NPS 144: Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.

3.03 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

- A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
 1. Use the following pipe couplings for nonpressure applications:
 - a. Sleeve type to join piping, of same size, or with small difference in OD.
 - b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
 - c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.
- B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.04 INSTALLATION, GENERAL

- 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 design considerations into account. Install piping as indicated, to extent practical.
- 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. Maintain swab or drag in line, and pull past each joint as it is completed.
- C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.

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- F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

3.05 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation.
- C. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: With rubber gaskets according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook." Use gaskets that match class of pipe and fittings.
- D. Hubless Cast-Iron Soil Pipe and Fittings: With CISPI-type couplings according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
- E. Hubless Cast-Iron Soil Pipe and Fittings: With heavy-duty-type couplings according to CISPI 310, CISPI's "Cast Iron Soil Pipe and Fittings Handbook," and coupling manufacturer's written instructions.
- F. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.
- G. Install with top surfaces of components, except piping, flush with finished surface.
- H. Corrugated-Steel Pipe: Join and install according to ASTM A 798. Use standard joints made with coupling bands, unless otherwise indicated.
- I. Corrugated-Steel Pipe: Join and install according to ASTM A 798. Use soiltight joints made with coupling bands and gaskets, unless otherwise indicated.
- J. PE Pipe and Fittings: As follows:
 - 1. Join pipe, tubing, and fittings with couplings for soiltight joints according to manufacturer's written instructions.
 - 2. Install according to ASTM D 2321 and manufacturer's written instructions.
 - 3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."
- K. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.
- L. PVC Sewer Pipe and Fittings: As follows:
 - 1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
 - 2. Install according to ASTM D 2321.
- M. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:
 - 1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.

SECTION 02630 - STORM DRAINAGE

- N. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
- O. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.06 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.
- C. Install precast concrete manhole sections with gaskets according to ASTM C 891.
- D. Construct cast-in-place manholes as indicated.
- E. Install fiberglass manholes according to manufacturer's written instructions.

3.07 CATCH-BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.08 STORM DRAINAGE INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipators at outlets, as indicated.

3.09 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.10 DRAINAGE SYSTEM INSTALLATION

- A. Assemble and install components according to manufacturer's written instructions.
- B. Install with top surfaces of components, except piping, flush with finished surface.

SECTION 02630 - STORM DRAINAGE

- C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- D. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.
- E. Fasten grates to channel sections if indicated.
- F. Embed trench sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

3.11 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.12 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
- B. Fasten grates to drains if indicated.
- C. Set drain frames and covers with tops flush with pavement surface.

3.13 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
- B. Abandoned Structures: Excavate around structure as required and use one procedure below:
 - 1. Remove structure and close open ends of remaining piping.
 - 2. Backfill to grade according to Division 2 Section "Earthwork."

3.14 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.

SECTION 02630 - STORM DRAINAGE

2. Place plug in end of incomplete piping at end of day and when work stops.
 3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
1. Submit separate 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. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to authorities having jurisdiction.
 3. Leaks and loss in test pressure constitute defects that must be repaired.
 4. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 02630

SECTION 02764 - PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Expansion and contraction joints within portland cement concrete pavement.
 - 2. Joints between portland cement concrete and asphalt pavement.
- B. Related Sections include the following:
 - 1. Division 2 Section "Portland Cement Concrete Paving" for constructing joints in concrete paving.

1.03 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Compatibility and Adhesion Test Reports: From joint sealant manufacturer indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backer materials have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.04 QUALITY ASSURANCE

SECTION 02764 - PAVEMENT JOINT SEALANTS

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: 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 ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
 - 3. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.01 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.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

SECTION 02764 - PAVEMENT JOINT SEALANTS

2.02 COLD-APPLIED JOINT SEALANTS

- A. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
- B. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.
- C. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Type SL Silicone Sealant for Concrete and Asphalt:
 - a. 890-SL; Dow Corning.
 - 2. Multicomponent Low-Modulus Sealant for Concrete and Asphalt:
 - a. SOF-SEAL; W.R. Meadows, Inc.

SECTION 02764 - PAVEMENT JOINT SEALANTS

2.03 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rod for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
- D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

2.04 PRIMERS

- A. Primers: Product recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint- sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.
- 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.

3.03 INSTALLATION OF JOINT SEALANTS

SECTION 02764 - PAVEMENT JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of backer materials.
 - 2. Do not stretch, twist, puncture, or tear backer materials.
 - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealants from surfaces adjacent to joint.
 - 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.

3.04 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.05 PROTECTION

SECTION 02764 - PAVEMENT JOINT SEALANTS

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 02764

SECTION 02810 – IRRIGATION WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes meter, backflow prevention system, valves, piping, sprinklers, specialties, accessories, controls, and wiring for lawn and planting irrigation systems.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 2 Section "Water Distribution"
- C. The term "Contractor" as used in this section shall refer to the Irrigation Contractor unless otherwise indicated.
- D. The Contractor shall review the drawings and specifications to coordinate work of this section with all other related work.
- E. Contractor shall visit the site and fully inform himself as to all existing conditions and limitations that may apply to the work.

1.03 DESCRIPTION

- A. Extent: Contractor is responsible for providing all services, labor, equipment, materials, and supplies to install a complete, fully operational automatic irrigation system as per the Drawings and per local and state requirements.
- B. Limits of Work: Drawings show project site boundary lines for the purpose of identification, within which the irrigation work is to be confined, unless noted otherwise.

1.04 REQUIREMENTS BY REGULATORY AGENCIES

- A. Ordinances and Regulations: Local, municipal and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications and their provisions shall be carried out by Contractor. However, when these specifications and drawings call for or describe materials, workmanship or construction of a better quality, higher standard or larger size, they shall take precedence over the requirements or such rules and regulations.
- B. Permits and Inspections: Permits for the installation or construction of the work which are required by the legally constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time. Contractor shall

SECTION 02810 – IRRIGATION WORK

also arrange for and pay costs in connection with inspections and examinations required by these authorities.

1.05 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide Owner with a complete, fully operational automatic irrigation system with all system components including, but not limited to: Meter, backflow preventer, controller(s), piping, valves, heads, drip system, rain and freeze sensors and wiring.
- B. Minimum Water Coverage: Not less than:
 - 1. Turf Areas: 100 percent.
 - 2. Precipitation rates must be consistently matched throughout any one zone.
- C. Components and Installation: Capable of producing piping systems with the following minimum working pressure ratings except where indicated otherwise.
 - 1. Pressure Piping (Mainline): Schedule 80, 200 psig (1380 kPa).
 - 2. Circuit and Drain Piping: Schedule 40, 160 psig (1104 kPa).

1.06 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data including pressure rating, rated capacity, settings, and electrical data of selected models for the following:
 - 1. Water meter.
 - 2. Backflow preventers, including test equipment.
 - 3. Pressure regulator (if required).
 - 4. Valves, including general-duty, underground, manual and automatic control, and types, and valve boxes.
 - 5. Sprinkler heads and drip equipment, including emitter tubing, drip tubes and emitters for spot irrigation, and devices.
 - 6. Controls, including controller wiring diagrams.
 - 7. Rain cut-off switch.
 - 8. Wiring and splicing.
 - 9. Automatic drain valve.
 - 10. Enclosures, valve boxes.
- C. Wiring diagrams for electrical controllers, valves, and devices.
- D. Submit project record (as built) drawings as specified below:
 - 1. Maintain one set of working prints for annotating installation additions, changes, relocations and corrections to the installation plan. Include all wiring as routed from controller to valves on the working prints. These shall be carefully recorded and kept up to date throughout the progress of the job to completion of the project, whereupon they shall be returned to the Owner, providing a permanent record of this work.

SECTION 02810 – IRRIGATION WORK

- E. Maintenance data and operating instructions for inclusion in "Operating and Maintenance Manual" to be provided to the Owner and shall include the following:
 - 1. Water meter.
 - 2. Backflow preventers, instructions for testing.
 - 3. Pressure regulators.
 - 4. Automatic and manual control valves.
 - 5. Drip irrigation emitters, filters, flush valves and vacuum relief valves.
 - 6. Sprinklers.
 - 7. Controllers

1.07 QUALITY ASSURANCE

- A. Comply with requirements of authority with jurisdiction for irrigation systems.
- B. Installer Qualifications: Engage an experienced Installer who has completed irrigation systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- C. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.
 - 1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
- D. Product Options: Irrigation system piping, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components with equal performance characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by the Architect. The controller and automatic control valves are to be of a single acceptable manufacturer as listed in the construction documents. The burden of proof of product equality is on the Contractor.
- E. Manufacturer's Specifications: The latest printed specifications of approved manufacturer of materials shall become part of these specifications.

1.08 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Verify that irrigation system piping may be installed in compliance with original design and referenced standards.
- B. Site Information: Reports on subsurface condition investigations made during design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.
- C. Damage by Leaks: Contractor shall be responsible for all damages to: the grounds; walks; roads; foundations; building piping system; electrical systems, their equipment and contents; persons or property from accidents or injuries directly or

SECTION 02810 – IRRIGATION WORK

indirectly caused by leaks in piping systems being installed or having been installed by Contractor. Repair, at Contractor's expense, all damages so caused. Repair work shall be done as directed by the Owner's Representative.

1.09 SEQUENCING AND SCHEDULING

- A. Coordinate irrigation systems work with landscape work specified in Division 2 Section "Landscaping."

1.10 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and label clearly describing contents.
 - 1. Sprinklers: Furnish quantity of units equal to 10 percent of amount of each type installed.
 - 2. Sprinkler Nozzles: Furnish quantity of units equal to 10 percent of amount of each type installed.
 - 3. Valve Keys: Furnish quantity of tee-handle units equal to 25 percent of amount of each type key-operated, control valve installed.
 - 4. Emitters, drip tube, and devices: Furnish quantity of units equal to 10 percent of amount of each type installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Automatic Control Valves:
 - a. Rainbird
 - 2. Control Valve Boxes:
 - a. Ametek by Plymouth Products Div., AMETEK.
 - b. NDS
 - 3. Sprinklers:
 - a. Rainbird
 - 4. Emitters, Drip Tubes and Devices (No substitutions):
 - a. Netafim Irrigation
 - 5. Controllers:
 - a. Rainbird
 - 6. Rain cut-off Switch/Moisture Sensor
 - a. Rainbird
 - 7. Freeze cut-off switch:

SECTION 02810 – IRRIGATION WORK

- a. Rainbird

2.02 AUTOMATIC IRRIGATION SYSTEMS COMPONENTS.

- A. General: Control valves, sprinkler heads, and controller shall be by a single manufacturer per the manufacturer's specifications. All drip irrigation components shall be of a single manufacturer per the manufacturer's specs.
- B. Controller shall be a solid state hybrid type with dual programming for lawn and shrub areas; 14 day programming (Minimum); capable of 3 start times per program minimum; watering delay; water conservation control; manual start of each station or entire program; non-volatile memory and fuse protected circuitry. Controls shall be installed in a lockable wall-mount steel enclosure.
- C. Pressure piping shall be: PVC schedule 80, rated 200 psig, with socket type pipe fittings and solvent cemented joints.
- D. Circuit piping shall be: PVC Schedule 40, rated 160 psig, with socket type pipe fittings and solvent cemented joints; OR polyethylene pipe with 100 psig minimum pressure rating.
- E. Wiring: Electrical system equipment shall comply with the Electric Code most recently adopted by the local authorities, and shall be UL-approved.
 - 1. Wiring between automatic controllers and remote control valves shall be direct burial copper wire, #14 AWG, Type UF, UL-approved 600 volt.
 - 2. Where more than 1 wire are grouped together in a trench, bundle together with tape at 10' intervals.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Investigate and determine available water supply water pressure and flow characteristics.

3.02 PREPARATION

- A. Inspection: Examine the areas and conditions under which landscape irrigation system is to be installed and notify the Contractor of conditions detrimental to the proper installation of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Owner's Representative.
- B. Sleeves and Conduits: Contractor for work under this Section shall be required to determine and/or verify the location of sleeves through walls/foundations, under walks, under paving and similar places and set sleeves. Contractor shall be required to determine and/or verify the location of conduits through walls and to the roof for the sensors and coordinate this work with the Electrical and General Contractors.

SECTION 02810 – IRRIGATION WORK

- C. Existing Utilities: Verify with the Architect, Owner and local utilities the location of all utility lines, in the project area, before irrigation system installation begins. Damage caused by this work to these utilities, shall be repaired at no additional cost to Owner.

3.03 SYSTEM DESIGN

- A. Design Pressures: Verify irrigation supply pressure and volume before installing equipment. Notify Architect if inconsistent with that shown on drawings.
- B. Location of Heads: Design location is approximate. Make minor adjustments as necessary to avoid plantings and other unforeseen obstructions. Do not compromise coverage of irrigation design.

3.04 EARTHWORK

- A. Trenching: Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom.
 - 1. Clearance: 6 inches (minimum) each side of pipe or conduit.
 - 2. 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 stones and sharp objects to avoid point loading.
 - 3. Pipe depth:
 - Pressure piping: 18 inches (300 mm) to top of pipe or sleeve, unless otherwise indicated.
 - Lateral piping: 12 inches (300 mm) to top of pipe or conduit, unless otherwise indicated.
 - 4. For pipes or sleeving less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and sleeving on an undisturbed subgrade.
 - 5. Where encountering rock or another unyielding bearing surface, carry trench excavation 3 inches below pipe invert elevation and install bedding course. Top of pipe to be no less than 12" below finish grade.
- B. Underground warning tape shall be installed to protect system wiring and mainline.
- C. Backfill excavations promptly, **but not before** completing the following:
 - 1. Surveying locations of underground utilities for record documents.
 - 2. Testing, inspecting, and approval of underground utilities.
 - 3. Removal of trash and debris from excavation.
 - 4. Removal of temporary shoring and bracing, and sheeting.
 - 5. Pressure testing system for a minimum of four hours as specified below, not to exceed 75% of pressure rating of pipe. System may be tested in portions as approved by Architect. Notify General Contractor 24 hours in advance of system pressure testing for inspection. General Contractor shall verify results of system pressure test.
- D. Compact backfill and fill materials in layers not more than 4 inches in loose depth.

SECTION 02810 – IRRIGATION WORK

1. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D 1557:
2. Under lawn or unpaved areas, compact the top 6 inches below subgrade and each layer of backfill or fill material at 90 percent maximum dry density.

3.05 FIELD QUALITY CONTROL

- A. Testing: Perform hydrostatic test of piping and valves before backfilling trenches. With prior approval, piping may be tested in sections to expedite work.
 1. Cap and subject the piping system to a static water pressure of 150 psig (345 kPa). Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
 2. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
 3. Sprinkler heads shall be installed and tested for operation in accordance with design requirements under normal operating pressure. All necessary adjustments to the sprinkler equipment as required shall be made to assure efficient operation.
 4. Drip System: Prior to backfilling, open the remote control valve and operate each circuit to check for leakage around both barbed and threaded PVC fittings. Make necessary corrections to stop leaks.

3.06 CLEANING AND ADJUSTING

- A. Flush dirt and debris from piping before installing sprinklers and other devices.
- B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.
- C. Carefully adjust lawn sprinklers so they will be flush with finish grade after completion of landscape work.
- D. Adjust settings of controllers and automatic control valves.

3.07 COMMISSIONING

- A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturers, proceed as follows:
 1. Verify that specialty valves and their accessories have been installed correctly and operate correctly.
 2. Verify that specified tests of piping are complete.
 3. Check that sprinklers and devices are correct type.
 4. Check that damaged sprinklers and devices have been replaced with new materials.
 5. Check that potable water supplies have correct type backflow preventers.
 6. Energize circuits to electrical equipment and devices.
 7. Adjust operating controls.

SECTION 02810 – IRRIGATION WORK

- B. Operational Testing: Perform operational testing after hydrostatic testing is completed, backfill is in place, and sprinklers are adjusted to final position.

3.08 SYSTEM OPERATION AND ACCEPTANCE

- A. Operate the completed system for the Architect and the Owner's inspection for final acceptance at which time each sprinkler head shall be visually checked for coverage, adjustment, installation and proper automatic or manual control. As built "working prints" will be checked for accuracy. Cleanup of the site will be checked; and general items such as manual drain valves, controller, and automatic control valves and quick coupler valves will be inspected for proper installation and operation. All loose equipment, including controller keys, and related equipment as required or as necessary for the Owner's operation of the system will be turned over prior to final acceptance.
- B. Instruct Owner's personnel or designated representative in complete operation and maintenance of the irrigation system including but not limited to the controller operation, maintenance of the systems filters and adjustment of heads.
- C. Maintenance: After final acceptance of the completed installation of irrigation related materials, Contractor for work under this section shall be made responsible for systems maintenance for 60 days and shall guarantee the design, parts and workmanship of irrigation system for a period of one year after final acceptance.
- D. Provide 7 days' written notice in advance of demonstration.

3.09 GUARANTEE

- A. After final acceptance of the completed installation of all irrigation related materials, Contractor for work under this section shall guarantee the design, parts and workmanship of irrigation system for a period of one calendar year.
- B. All materials and equipment shall be warranted in writing against defect in materials and workmanship by the respective manufacturers. These written warranties shall be assembled and given to the Owner at the time of final acceptance. All installation work shall be guaranteed for one calendar year after final acceptance. No claims under warranty shall be considered for materials damaged or destroyed by vandals or damages caused by unauthorized operation of the system.
- C. Contractor shall meet with Owner's Representative two weeks prior to the termination of the one year guarantee and run the system one more time and make all necessary changes, repairs, etc. as are needed to deliver a final working system to the Owner.

END OF SECTION

SECTION 02900 - LANDSCAPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. See also description of alternative #3 on the Construction Drawings, sheets C3 and C4.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Lawns.
 - 2. Topsoil and soil amendments.
 - 3. Fertilizers and mulches.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 2 Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
 - 2. Division 2 Section "Earthwork" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.
 - 1. Manufacturer's certified analysis for standard products.
- C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and 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.
 - 1. Certification of each seed mixture for sod, identifying sod source, including name and telephone number of supplier.
- D. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with

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requirements indicated.

1. Analysis of existing surface soil.
 2. Analysis of imported topsoil.
- E. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.
- B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.06 PROJECT CONDITIONS

- A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

1.07 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

1.08 LAWN MAINTENANCE

- A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
1. Seeded Lawns: 60 days after date of Substantial Completion.

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- a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season.
- B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches (100 mm).
 - 1. Water lawn at the minimum rate as indicated on the Construction Drawings.
- D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.
- E. Post-fertilization: Apply fertilizer to lawn after first mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of lawn area.

PART 2 - PRODUCTS

2.01 GRASS MATERIALS

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.
 - 1. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on drawings.

2.02 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1 inch (25 mm) or larger in any dimension, and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

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2.03 SOIL AMENDMENTS

- A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 (2.36 mm) sieve and a minimum 75 percent passing a No. 60 (250 micrometer) sieve.
 - 1. Provide lime in the form of dolomitic limestone.
- B. Aluminum Sulfate: Commercial grade, unadulterated.
- C. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.
- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Peat Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed moss peat (other than sphagnum), peat humus, or reed-sedge peat.
- F. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
 - 1. When site treated, mix with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cu. ft. (cu. m) of loose sawdust or ground bark.
- G. Manure: Well-rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
- H. Herbicides: EPA registered and approved, of type recommended by manufacturer.
- I. Water: Potable.

2.04 FERTILIZER

- A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. 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-form, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- C. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following

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composition:

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

2.05 MULCHES

- A. Fiber Mulch: Biodegradable dyed-wood cellulose-fiber mulch, nontoxic, free of plant growth- or germination-inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- B. Non-asphalt Emulsion Tackifier: Nontoxic and free of plant growth- or germination-inhibitors.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PLANTING SOIL PREPARATION

- A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
- B. Mix soil amendments and fertilizers with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.
- C. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.
 1. Mix lime with dry soil prior to mixing fertilizer. Prevent lime from contacting roots of acid-tolerant plants.
 2. Apply phosphoric acid fertilizer, other than that constituting a portion of complete fertilizers, directly to subgrade before applying planting soil and tilling.

3.03 LAWN PLANTING PREPARATION

- A. Limit subgrade preparation to areas that will be planted in the immediate future.
- B. Loosen subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials.
- C. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if

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planting soil or subgrade is frozen.

1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
- D. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:
1. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.
 2. Till surface soil to a depth of at least 6 inches (150 mm). Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.
 3. Clean surface soil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 4. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.
- F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.04 SEEDING NEW LAWNS (OUTSIDE OF SOCCER FIELD PERIMETER)

- A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
- B. Sow seed at the following rates:
1. Seeding Rate: 3 to 4 lb. per 1000 sq. ft. (1.5 to 2 kg per 100 sq. m).
- C. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with

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fine spray.

- D. Protect seeded areas with slopes less than 1:6 against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acre (45 kg per 100 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
- E. Hydroseeding is an acceptable alternative, at Contractor's option.

3.05 SPRIGGING AREA WITHIN SOCCER FIELD PERIMETER

- A. See Construction Drawing for base bid sprigging requirements.

3.06 RECONDITIONING LAWNS

- A. Recondition existing lawn areas damaged by Contractor's operations, including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor regrading is required.
- B. Remove vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- C. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- D. Till stripped, bare, and compacted areas thoroughly to a depth of 6 inches (150 mm).
- E. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Provide new planting soil as required to fill low spots and meet new finish grades.
- F. Apply seed as required for new lawns.
- G. Water newly planted areas and keep moist until new grass is established.

3.07 CLEANUP AND PROTECTION

- H. During landscaping, keep pavements clean and work area in an orderly condition.
- I. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.08 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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- J. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

3.09 SEED MIXTURES SCHEDULE

- A. Sun and Partial Shade: Provide certified grass-seed blends or mixes, proportioned by weight, as follows:

<u>Proportion</u>	<u>Name</u>	Min. Pct. <u>Germ.</u>	Min. Pct. <u>Pure Sd.</u>	Max. Pct. <u>Weed Sd.</u>
50 %	Kentucky 31	80%	85%	0.5%
30 %	Chewings red fescue	85%	98%	0.5%
10 %	Perennial rye grass	90%	98%	0.5%
10 %	Redtop	85%	92%	1%

END OF SECTION 02900

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that _____ having an office at _____, as Principal, hereinafter called CONTRACTOR, and _____, having an office at _____, as Surety, hereinafter called Surety, are held and firmly bound unto the _____, having an office at _____, as Obligee, hereinafter called OWNER, for the use and benefit of claimants as hereinbelow defined, in the amount of _____ Dollars (\$ _____), for they payment whereof CONTRACTOR and Surety bind themselves, their heirs, executors, administrations, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, CONTRACTOR has by written agreement dated _____, 2003 entered into a Contract with the OWNER for the construction of the project entitled Dupont Soccer Complex @ North Access Road, Chattanooga, Tennessee in accordance with Drawings and Specifications prepared by **March Adams & Associates, Inc.**, which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, the condition of this obligation is such that, if CONTRACTOR shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the OWNER.

Whenever CONTRACTOR shall be and declare by OWNER to be in default under the Contract, the Surety shall promptly remedy the default. If the OWNER terminates the Contract for such default, the following precautions shall govern the liability of the CONTRACTOR and the Surety hereunder.

In the event of such termination, the CONTRACTOR and the Surety shall remain fully liable to the OWNER for the CONTRACTOR'S failure to timely complete the Contract, any additional costs incurred by the OWNER in completing the Contract, and liquidated damages from the originally scheduled completion date to the date of the actual completion of the work by the OWNER.

In the event of such termination, the Surety company may elect to take over and complete performance of the Contract by giving written notice to the OWNER of such determination within seven (7) days of the OWNER'S mailing of notice of termination to the Surety and actually commencing completion with fourteen (14) days of the OWNER'S notice to the Surety.

The Surety shall fully complete the work by the originally scheduled date of completion and the CONTACTOR and the Surety shall remain liable to the OWNER for all damages sustained by the OWNER and for liquidated damages for delay.

Any suit under this bond must be instituted before the expiration of one (1) year from the date on which final payment under the Contract falls due or before the expiration of two (2) years from the Date of Substantial Completion of the Project, whichever is later.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the OWNER named herein or the heirs, executors, administrators or successors of the OWNER.

Signed and sealed this _____ day of _____, 20_____.

WITNESS:

CONTRACTOR:

(SEAL)

Witness

By: _____

Title

WITNESS:

Name of Surety

(SEAL)

Witness

By: _____
Attach Power of Attorney

Title

LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that _____ having an office a _____, as Principal, hereinafter called CONTRACTOR, and _____, having an office at _____, as Surety, hereinafter called Surety, are held and firmly bound unto _____, _____, having an office at _____, as Obligee, hereinafter called OWNER, for the use and benefit of claimants as hereinbelow defined in the amount of _____ Dollars (\$_____), for the payment whereof CONTRACTOR and Surety bind themselves, their heirs, executors, administrators, successor and assigns, jointly and severally, firmly by these presents.

WHEREAS, CONTRACTOR has by written agreement _____, 2002, entered into a Contract with the OWNER for the construction of the project **Dupont Soccer Complex @ North Access Road, for the City of Chattanooga, Tennessee**, in accordance with Drawings and Specifications prepared by **March Adams & Associates, Inc.**, which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if CONTRACTOR shall promptly make payment of all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however to the following conditions:

1. A claimant is defined as one having a direct contract with the CONTRACTOR or with a Subcontractor of the CONTRACTOR for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.
2. The above named CONTRACTOR and Surety hereby jointly and severally agreed with the OWNER that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgement for such sum or sums as may be justly due claimant, and have execution thereon. The OWNER shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:
- a) Unless claimant, other than one having a direct contract with the CONTRACTOR, shall have given written notice to any two of the following: the CONTRACTOR, the OWNER or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the CONTRACTOR, OWNER or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.
 - b) After the expiration of one (1) year following the date on which CONTRACTOR ceased Work on said Contract or after the expiration of one (1) year following the Date of Substantial Completion of the Project, whichever is later, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.
 - c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, on any part thereof, is situated, and not elsewhere.
4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against such improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this _____ day of _____, 20____.

WITNESS:

CONTRACTOR:

(SEAL)

Witness

By: _____

Title

WITNESS:

Name of Surety

(SEAL)

Witness

By: _____
Attach Power of Attorney

Title

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART I - GENERAL

1.01 SCOPE

- A. This section covers formwork, rebars and all other materials, equipment and methods for mixing, placing, testing, finishing, curing, etc. all plain and reinforced, cast-in-place, normal weight concrete.
- B. All embedded items required by other trades under the General Construction Contract shall be set under this section.
- C. Items not included in the General Construction Contract shall be furnished and placed by the trade requiring these items to be embedded in concrete, but the General Contractor shall cooperate with these trades in order that they are afforded an opportunity to make their installations before concrete is placed.

1.02 RELATED WORK

- A. Concrete Curing & Finishing - Section 03305

1.03 REFERENCE STANDARDS FOR QUALITY ASSURANCE

- A. All work, testing and inspection shall be in accordance with the applicable sections, and references therein, of the Specifications and Standards of the following:
 - 1. Locally Adopted Building Code
 - 2. American Concrete Institute (ACI)
 - 3. Concrete Reinforcing Steel Institute (CRSI)
 - 4. American Society For Testing Materials (ASTM)
 - 5. PS-1-U.S. Product Standard for Softwood Plywood.
- B. In conflicts between this specification, industry standards and/or local building codes, the more stringent requirements shall govern.

1.04 SUBMITTALS

- A. Shop drawings for all form work where appropriate and requested.
- B. Shop drawings for placing of all reinforcing steel.
- C. A trial mix prepared by an independent testing laboratory for each class of concrete and for each size and gradation of aggregate proposed for the project. The preliminary mix design submittals shall contain the applicable information all components of the mix. After mix is established and approved, substitutions shall not be made. (See Paragraph 3.07 - TESTING)

PART II - PRODUCTS

2.01 FORMWORK

- A. Forms for surfaces which will be exposed to view shall be plywood, steel or lined forms meeting the architectural requirements of the project. Metal or fiberglass forms shall be used for joist and waffle slabs.
- B. Form ties shall be designed by the Contractor.
- C. Form releasing agent shall be non-staining "Form Oil" as manufactured by Texaco, Sinclair or Nox-Crete Form Coating.

SECTION 03300 - CAST-IN-PLACE CONCRETE

2.02 REINFORCING STEEL

- A. Bars shall be deformed billet-steel bars conforming to ASTM A 615. All bars should be grade 60. All bars shall be shop-fabricated and bent cold. Bars shall be free from defects and kinks and from bends not indicated on the Drawings or approved bending diagrams.
- B. Mesh reinforcement shall be electrically welded, plain wire fabric conforming to ASTM A 185. Wire shall be cold-drawn mild steel conforming to ASTM A 82.
- C. Tie wire shall be of black annealed steel, 16-gage minimum.
- D. Metal accessories per CRSI.

2.03 CONCRETE

- A. Cement shall be an American brand approved by the engineer, conforming to ASTM C-150, Type 1, unless another type is specified. For exposed surface one brand shall be used throughout.
- B. (NOTE: All concrete exposed to freezing and de-icing agents shall have a minimum of 564 pounds (6 bags) of cement per cubic yard with a maximum water/cement ratio of .5 lbs/lb and 5 percent entrained air.)
- C. Coarse aggregate shall be crushed stone or gravel having clean, hard durable uncoated particles sized within the limits of ASTM C-33, Table 2, Size No. 57.
- D. Fine aggregate shall be clean, hard, durable natural siliceous river sand with uncoated grains free from all organic material or other impurities meeting ASTM C-33. Manufactured sand shall not be used.
- E. Mixing water shall be clean, potable, free from oil, acids, salts, alkalies and injurious amounts of vegetable matter.
- F. ADMIXTURES:
 - 1. All exterior concrete shall have an air-entraining agent (ASTM C-260) equal to Masterbuilders MBVR to produce a plastic mix with 6% +/- 1% of entrained air. It shall be included in the trial design mixes submitted to the Engineer for approval.
 - 2. All interior concrete shall have an air-entraining agent (ASTM C-260) equal to Masterbuilders MBVR to produce a plastic mix with 2% - 3% of entrained air. It shall be included in the trial design mixes submitted to the Engineer for approval.
 - 3. No other admixture shall be used without the written permission of the Architect/Engineer.
- G. Curing materials per Section 03305.

2.04 JOINT FILLER

- A. Expansion joint filler shall be preformed resilient, non-extruding, non-bituminous, fiber type conforming to ASTM D-1751 or D-544.

2.05 WATER STOPS

- A. Flexible polyvinyl, 3/8" X 6" ribbed type with center bulb.

PART III - EXECUTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

3.01 FORMWORK

- A. Where applicable forms shall be placed according to approved shop drawings.
- B. Erect forms to required dimensions and cross-sections, free of surface defects, tied, shored and braced to movement and leakage of mortar. Any defective formwork and/or defective concrete shall be removed at Contractor's expense.
- C. Metal and/or fiberglass pans that are bent, badly rusted, cracked or otherwise damaged shall not be used and shall be removed from the site.
- D. Provide forms for footings if soil or other conditions are such that earth trench forms are unsuitable. Omission of forms shall be approved by the Architect/Engineer.
- E. Construct forms so they can be removed readily without hammering or prying against the concrete.
- F. Provide box-outs, bulkheads with keys, cleanouts, expansion joint strips, and other related items and features.
- G. Chamfer all exposed outside corners unless otherwise instructed.
- H. Tolerances shall be within the limitations set forth in ACI 347.

3.02 FORM COATING

- A. Immediately before the placing of reinforcing, faces of all forms in contact with the concrete shall receive a thorough coating of the liquid form releasing agent specified, applied in compliance with the manufacturer's instructions. After oiling, any surplus oil on the form surfaces shall be removed.

3.03 REMOVAL OF FORMS

- A. No forms shall be removed without the approval of the Architect/Engineer. In general and under normal conditions the Architect/Engineer will approve removal of forms as follows:
 - 1. Concrete beams, slabs and other members which span between definite supports shall attain 70% of the specified 28-day strength before removal of the forms. Shores for cantilevered beams and slabs shall remain in place for at least an additional 21 days.
 - 2. Pan forms may be removed after three days if pans are designed for early removal. Soffit boards shall not be disturbed and shall not be removed for a minimum of eight days.
 - 3. Under ordinary weather conditions, wall forms, column forms, side of beam forms and other vertical forms for concrete which do not span between definite supports may be removed after two days.
 - 4. Forms for footings may be removed after 24 hours under ordinary weather conditions.
 - 5. When ambient air temperature falls below 45 degrees F during the curing period form removal shall take place based on job-cured test cylinder strength only.
 - 6. After removing forms, horizontal members shall be promptly re-shored at mid-span until the 28-day strength of concrete is attained. No floor shall be loaded in excess of live load for which designed unless adequate shores are placed beneath members supporting the concentration of load.

SECTION 03300 - CAST-IN-PLACE CONCRETE

7. Under no circumstances shall wood be buried in full or left in contact with earth. All wood formwork shall be removed unless noted or specified otherwise.
8. Care shall be taken in the removal of the forms to avoid damage to concrete surfaces. Immediately after the forms are removed, all damaged or imperfect work shall be patched, or, if the work is severely damaged or unacceptable, it shall be rebuilt. Remove all fins from exposed concrete surfaces immediately on removal of forms.
9. Forms to be reused shall be thoroughly cleaned and repaired. Split, frayed, delaminated, or otherwise damaged forms shall not be used.

3.04 REINFORCING STEEL

- A. Shop fabricate from approved shop drawings. Bars shall not be heated for bending. Return all horizontal bars 2'-0" (or provide individual corner bars) at all corners and intersections in all concrete walls and footings. All bars marked continuous shall be lapped with a Class "B" tension splice, including at corners. Splices shall be located as shown in accordance with CRSI Standards. Provide diagonal corner bars at corners of all openings in slabs and walls. Use 2-#5 X 4'-0" each corner, each face. If embedment length is not available provide standard hook. General placement and bar coverage shall be in accordance with ACI 318.
- B. At job site store at least 12" above ground. Bars shall be free of foreign matter. A thin coating of orange rust resulting from short exposure will not be considered objectionable.
- C. Reinforcement which has been exposed for bonding with future work shall be protected from corrosion by heavy wrappings of burlap saturated with a bituminous material.
- D. Notify the Engineer at least 24 hours prior to scheduled pouring of concrete for inspection of reinforcing steel. No concrete shall be poured until reinforcement placement is approved. Such approval shall not relieve the Contractor of his responsibility for correctness and compliance with the Contract Documents.

3.05 PRODUCTION OF CONCRETE

- A. Concrete shall be produced in an approved central mixing plant in accordance with ASTM C-94.
- B. Unless otherwise called for on the drawings, concrete shall develop a compressive strength at 28 days, when tested in accordance with the applicable sections of ASTM, as follows:
 1. Interior floor slabs and footings - 3000 psi
 2. Columns, beams, walks, curbs and concrete exposed to the weather - 4000 psi.

3.06 PLACING OF CONCRETE

- A. Concrete shall be placed in compliance with the applicable sections of the ACI. Special attention shall be given to the requirements for slump, testing, curing, tolerances and placing during severe weather.
- B. Forms shall be free of ice, water, hardened concrete, and debris and items to be embedded shall be in position.
- C. Subgrades shall be sprinkled sufficiently to eliminate water loss from concrete.

SECTION 03300 - CAST-IN-PLACE CONCRETE

Concrete shall not be placed on frozen ground.

- D. Concrete shall be transported by methods to avoid segregation. Do not use vibrators to transport concrete in forms. Concrete shall be placed rapidly and continuously and as close to its final position as possible. If construction joints are required they shall be placed at a location causing the least effect on the structural integrity of the work.
- E. Concrete shall be consolidated by vibration, spading and rodding. Work concrete around reinforcement and embedded items.
- F. Provide a drainage system for all retaining walls that are a part of the structure.
- G. Coordinate all drawings for proper slope of floor to drains in toilets, showers and similar areas.

3.07 TESTING

- A. The verification and control of concrete mixes shall be the work of an independent testing laboratory. The selection of laboratory and cost of testing shall be paid for by the Owner unless other arrangements are made.

B. LABORATORY SERVICES

- 1. Test aggregates, cement and water for specification compliance. During construction, the Engineer may require field inspection, sampling, and testing of cement, aggregates, etc. testing laboratory in order to determine if the requirements of this specification section are being satisfied.
- 2. Prepare trial mix for each class of concrete, make and break test cylinders. A minimum of two cylinders shall be tested at 7-days and 28-days.
- 3. Make slump test and air content test at job site for each sample tested for compressive strength.

- C. Test cylinders shall be made and tested as follows:

One (1) set of five (5) cylinders shall be made for each fifty (50) cubic yards or fraction thereof for each class of concrete in each day's pour. Of each set of test cylinders, two (2) shall be broken at seven (7) days, two (2) shall be broken at 28-days, and one (1) held in reserve.

Test cylinders will normally be laboratory-cured. However, the Engineer may require tests on field-cured specimens to check the adequacy of curing operations.

- D. Reports on all tests conducted by the laboratory shall be rendered promptly and distributed as follows:

Architect	One - (1) copy
Contractor	Two - (2) copies
Structural Engineer	One - (1) copy

Report of control cylinders for job placed concrete shall contain the following:

- 1. Time of batching
- 2. Time of sampling
- 3. Concrete and air temperatures
- 4. Slump

SECTION 03300 - CAST-IN-PLACE CONCRETE

5. Other information furnished by the General Contractor

E. CONTRACTORS FUNCTION

1. Contractor shall advise testing agency in advance of operations to allow for assignment of testing personnel and shall provide reasonable labor and assistance in obtaining, handling and storing test samples at the site.
2. Contractor shall observe procedures of laboratory personnel molding and handling test specimens and if he observes any irregularities of procedures, he shall report them in writing to the Architect within 48-hours.
3. Contractor shall keep a daily log recording quantities of each class of concrete used, the area location of each quantity of concrete relating to its controlling cylinder and the slump of this concrete, and general weather conditions. The contractor shall furnish this information to the laboratory for inclusion in the test report. The Contractor shall obtain delivery tickets showing the class and strength of concrete, the size of coarse aggregate and the slump order. The Contractor shall identify these tickets relative to the area of placement of the concrete and shall retain them on file. He shall produce the tickets should the Architect/Engineer so request.

3.08 PRECAUTIONS

- A. Styrofoam shall not be used as joint filler.
- B. Manufactured sand shall not be used for fine aggregate.
- C. Severe weather concreting shall be in accordance with ACI-305 and ACI-306.
- D. Retempered concrete shall not be used.
- E. Defective Work - No materials or concrete which fail to conform to the requirements of this specification section shall be incorporated into the work.
- F. Water stops shall be continuous. Do not use lap joints.
- G. The placing of dowels after concrete is poured is prohibited. Bars partially embedded in concrete shall not be field-bent.
- H. Calcium chloride shall not be used.

3.09 CLEAN-UP

- A. After completion of work, remove from the site all excess materials and debris.

END OF SECTION

SECTION 03305 - CONCRETE CURING AND FINISHES

PART I - GENERAL

1.01 SCOPE

- A. Provide all materials, equipment, incidentals and labor for patching, finishing, curing and protecting from flowing water and mechanical injury the concrete specified.

1.02 RELATED WORK

- A. Cast-In-Place Concrete - Section 03300

1.03 REFERENCED STANDARDS FOR QUALITY ASSURANCE

- A. All work shall be in accordance with the applicable sections and references therein, of the Specifications and Standards of the following:
 - 1. American Concrete Institute (ACI)
 - 2. American Society For Testing Materials (ASTM)
- B. In conflicts between this specification, industry standards and/or local building codes, the more stringent requirements shall govern.

1.04 SUBMITTALS

- A. Product data on curing compounds.

PART II - PRODUCTS

2.01 WATER CURING

- A. Heavy burlap weighing at least 10 ounces per square yard.
- B. Clean river sand, ASTM C-33.
- C. Sawdust

2.02 MEMBRANE CURING

- A. Waterproof sheet material conforming to ASTM C-171, Standard Specification for Sheet Materials For Curing Concrete.

2.03 LIQUID CURING

- | | |
|-------------------------------|--------------------------------|
| 1. "Kure-N-Seal" | Sonneborn |
| 2. "Clear Bond" | Guardian Chemical |
| 3. "Clear Seal" | (A.C. Horn) Grace Construction |
| 4. "Encocure" or Kurez E-100" | Euclid Chemical Co. |
| 5. "Clear Seal" | Lambert Corporation |
| 6. "Chem-Seal" | Hillyard Chemical Co. |
| 7. "Masterseal" | Master Builders |

PART III - EXECUTION

3.01 PATCHING OF CONCRETE

- A. Immediately after removing forms, all surfaces shall be inspected for defective work. Any concrete which is poorly formed, out of alignment or level, or shows a defective service, shall at the election of the Engineer, be removed from the job by the

SECTION 03305 - CONCRETE CURING AND FINISHES

Contractor at the Contractor's expense. The engineer may grant permission to patch or repair defective work; but such permission shall not be considered a waiver of the Engineer's right to require complete removal of the defective work, if in the Engineer's opinion, the patching or repairs do not satisfactorily restore the quality and appearance of the items in question.

- B. Where permitted by the Engineer, all honeycombs, voids, stone pockets, tie holes and other defective areas shall be patched as soon as practicable. Patching shall be done in accordance with the following procedure.
1. Defective areas shall be chipped away to a depth of at least 1" with the edges cut perpendicular to the surface.
 2. The area to be patched and space at least 6" wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar.
 3. A grout of equal parts of Portland Cement and sand, with sufficient water to produce a brushing consistency, shall be well brushed into the surface followed immediately by the patching mortar.
 4. The patch shall be made of the same materials and of approximately the same proportion as used for the concrete except that the coarse aggregate shall be omitted. The mortar shall not be richer than 1 part cement to 3 parts sand. The proportions of white and gray cements shall be determined by making a trial patch. The amount of mixing water used shall be the minimum consistent with the requirements of handling and placing. The mortar shall be retempered without the addition of water by allowing it to stand for one hour, during which time it shall be mixed with a trowel to prevent setting.
 5. The mortar shall be thoroughly compacted into place and screened off so as to leave the patch slightly higher than the surrounding surface. The patch shall then be left undisturbed for one to two hours to permit initial shrinkage before being finally finished.
 6. The patched areas shall be finished to match the adjoining surface. On exposed surfaces, where unlined forms have been used, the final finish shall be obtained by striking off the surface with a straight edge spanning the patch and held parallel to the form marks.
 7. Curing of the patched areas shall be in accordance with these specifications.
 8. Contractor's Option:
In lieu of mixing grout for patching, the Contractor may provide a PVC bonding agent recommended by the manufacturer for the use intended. Approved products and manufacturers:
 - a. "Dara Weld C" by W.R. Grace
 - b. "Weldcrete" by E.A. Larson
 - c. "Vinyl Hesive" by Nox-Crete

3.02 CONCRETE FLOORS

(All floors, suspended slabs, and slabs on grade)

- A. The surface of all concrete shall be worked with a wood float or by machine in a manner which will compact the concrete and produce a surface free of depressions or

SECTION 03305 - CONCRETE CURING AND FINISHES

inequalities of any kind. Test for grade (or level) and correct as necessary by removing excess or adding and compacting additional concrete. After the concrete has hardened sufficiently to prevent fine material from working to the top (when the sheen or shiny film of water on the surface has disappeared), the surface shall be finished in accordance with the applicable following paragraphs, but excessive working shall be avoided. Final finishing shall not be started until all surface water has disappeared. The drying of the surface moisture must proceed naturally and must not be hastened by sacking or dusting-on of dry sand and/or cement.

- B. After finishing concrete floors, and before traffic is allowed over them, the floors shall be covered with one layer of Sisal Kraft or approved similar heavy waterproof paper lapped at least 4" with lap continuously filled with waterproof cement. In case of damage or injury to the paper, it shall be replaced immediately. It is the intent of this specification to protect the floors for acceptance by the Engineer. At the end of the job, or just prior to application of permanent floor coverings, slabs shall be thoroughly cleaned and left in suitable condition for installation of permanent covering.
- C. Tolerances
 - 1. While still plastic, concrete surfaces shall be testing for surface irregularities with a 10' straightedge and the necessary corrections made. Allowable irregularities is 1/8" in 10', non-accumulating.
 - 2. Slab surfaces to receive topping or setting bed, 1/4" to 10'.
 - 3. Floor slab surfaces shall slope uniformly to floor drains as shown on the drawings.
- D. Monolithic finish for Slabs

All interior floor slabs shall have a steel trowel finish (except for floor slabs to receive ceramic tile). The steel troweling shall produce a smooth finished surface free of pin holes and other imperfections.
- E. Depressed slabs shall have a rough screed finish at levels indicated on the drawings.
- F. Broom finish shall be used for all interior stairs unless shown otherwise. Slabs and landings shall be troweled to a smooth, even surface and receive a light broom finish.

3.03 FINISHES ON FORMED CONCRETE SURFACES

- A. Common finish shall be confined to concrete surfaces which will be covered by other construction and which will not be visible. This finish shall be produced by filling smoothly all tie holes, honeycomb and other depressions, knocking off and evening-up burrs and form marks.

3.04 CURING AND SEALING COMPOUND APPLICATION

- A. Curing and sealing compound shall be applied as soon as the concrete has set sufficiently so as not to be marred by the application. Preparation of surfaces, quantities used, application procedures, and installation precautions shall be followed in strict compliance with the manufacturer's stated recommendations and directions as set forth on the package.
- B. Final curing shall continue for 7-days minimum.

END OF SECTION

SECTION 03305 - CONCRETE CURING AND FINISHES

SECTION 04220 - CONCRETE UNIT MASONRY

PART I - GENERAL

1.01 DESCRIPTION

- A. The work covered by this Section consists of furnishing all labor, equipment, and material required for the correct placement and construction of concrete masonry units and related work as described herein and/or shown on the Drawings.
- B. Work for Other Trades: Bolts, anchors, and shelf angles shall be the responsibility of the Contractor. However, the subcontractors requiring such work are responsible for furnishing complete information to the Contractor.

1.02 SUBMITTALS

- A. Samples: Submit two full-size concrete masonry units of each type, including special shapes required to show range of colors, texture, finishes, and dimensions.
- B. Certificate: Furnish manufacturer's written certification accompanied by suitable laboratory or mill test reports that masonry units furnished meet or exceed the requirements of this specification.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

Store masonry units above ground on level platforms, which allow air circulation under stacked units. Cover and protect against wetting prior to use. Handle units on pallets or flat bed barrows. Do not permit free discharge from conveyor units or transporting in mortar trays.

PART II - PRODUCTS

2.01 MATERIALS

- A. Concrete Masonry Unit: Hollow bearing units shall conform to ASTM C 90, Grade N, Type I, normal weight. Nominal face dimension shall be 8 by 16 inches, except where otherwise noted on the Drawings. All masonry units shall be obtained from a single manufacturer whose manufacturing and curing facilities are acceptable to the Engineer.
- B. Reinforcement: Block wall reinforcement shall be of the prefabricated type for use in masonry mortar joints. Wall reinforcement shall be of truss design for composite wall construction with No. 9 gauge deformed galvanized side be placed in first and second bed joint above and below openings, as specified above, and in every second bed joint throughout the remainder of the wall.
- C. Reinforcement in the first bed joint immediately above and below openings shall be continuous. In the second bed joint it shall extend 2 feet beyond each side of the opening. Reinforcing shall be lapped a minimum of 6 inches at splices. Corner and abutting wall reinforcement shall be prefabricated corner and tee sections.
- D. Precast Sills and Lintels: Precast concrete sills, coping, trim, and lintels shall be provided as shown on the Drawings. All exterior sills, coping, and trim shall be constructed of white portland cement and light granite aggregate. Interior lintels shall be constructed of gray portland cement and marble aggregate. All exposed surfaces shall be ground and treated with a water-repellent material.
- E. Contractor shall submit detail drawings of precast sills, coping, and lintels for approval by the Engineer before proceeding with fabrication. Finished precast units shall be thoroughly protected against chipping and in no case will chipped surfaces or corners be permitted to remain in walls or copings.

SECTION 04220 - CONCRETE UNIT MASONRY

PART III - EXECUTION

3.01 ERECTION AND WORKMANSHIP

- A. Scaffolding shall not be overloaded and shall be inspected regularly by the Contractor to see if it is amply strong, well braced, and securely positioned. The Contractor shall be unconditionally responsible for the safety of the scaffolding at all times.
- B. Masonry shall not be laid when the temperature is below 40 degree F. Walls shall be carried up level and plumb all around. Unfinished work shall be stepped face for joining with new work; toothing shall not be permitted. Heights of masonry shall be checked by the Contractor with an instrument at each floor and at sills and heads of openings to maintain the level of the walls.
- C. Masonry units shall be handled with care to avoid chipping, cracking, and spalling of faces and edges. Drilling, cutting, fitting, and patching to accommodate the work of others shall be performed by qualified masons. Masonry shall be cut with a masonry saw outside buildings. Chipping or breaking with a hammer will not be permitted.
- D. Door and window openings, louvered openings, anchors pipes, ducts, and conduits shall be built in carefully as the work progresses. Ties and anchors shall be placed accurately. Metal work specified elsewhere shall be placed in position as the work progresses. Grouting of ties and anchors into hardened mortar or grout shall not be permitted.
- E. Masonry units shall be laid in running bond. The first course of masonry shall be laid in a full bed of mortar; and the succeeding courses shall be shoved (not laid) in beds of mortar to fill the joints full without subsequent flushing and filling. Unless shown or specified otherwise, all joints shall be 3/8-inch thick. Where ties, anchors and bolts occur within the cells of the units, such cells shall be filled with mortar or grout as the work progresses.
- F. Concrete masonry units shall be dry when laid. Each unit shall be adjusted to final position in the wall while the mortar is still soft and plastic. Any unit disturbed after mortar has stiffened shall be removed and relaid with fresh mortar. Vertical cells to be filled with grout shall be aligned to provide a continuous unobstructed opening of the dimensions shown. Chases shall be plumb and shall be minimum one-unit length from jambs of opening.
- G. Masonry joint reinforcement shall be placed so that longitudinal wires are located over face wall mortar beds and are fully embedded in mortar for their entire length with minimum mortar cover of 5/8 inch on exterior side of walls and 1/2 inch at other locations.
- H. Joints shall be finished with smooth concave contour. Procedure used in striking joints shall be as follows: First strike the bed joints; next strike the head joints; then strike bed joints as required to remove any spots, etc., from intersection of bed and head joints. After mortar has initial set but before mortar is hard, restrike the head joints to provide clean, smooth intersection of the head and bed joints.
- I. At the end of each day's work, the tops of exposed masonry walls shall be covered with a strong, nonstaining waterproof membrane well secured in place. Surfaces not being worked on shall be properly protected at all times. Unfinished work shall be stepped for joining with new work. Before new work is started, all loose mortar shall be removed and the exposed joint thoroughly wetted, not less than 1/2 hour before

SECTION 04220 - CONCRETE UNIT MASONRY

laying new work.

- J. All cavities in exterior masonry walls shall be filled with loose fill insulation in accordance with the requirements of the section entitled "Building Insulation" of these Specifications.

3.02 CLEANING

- A. During construction, care shall be taken to keep exposed face of masonry clean of mortar and other stains. Joints shall be raked as they reach thumbprint hardness. The exposed work shall then be brushed with a soft fiber brush to remove adhering mortar. A wooden paddle shall be used to remove more tenacious material. Bases of walls shall be protected from splash stains by covering the adjacent floor or ground with sand, sawdust, or polyethylene film.
- B. At completion of work, holes in exposed masonry shall be pointed and defective joints shall be cut out and tuck pointed solidly with mortar.
- C. If necessary, exposed masonry surfaces shall be scrubbed with warm water and soap and fiber brush and thoroughly rinsed with clear water. Work that may be damaged, discolored, or stained shall be protected during the cleaning process. The use of sapolio or wire brushes or acid for washing down walls shall not be permitted.
- D. Protect all finished work against freezing for a period of not less than 48 hours by means of enclosures, temporary heat, or such other protective methods as may be required and directed by the Engineer.

END OF SECTION

SECTION 05100 - STRUCTURAL STEEL

PART I - GENERAL

1.01 SCOPE

- A. This section covers all items fabricated from metal shapes, plates, rods and bars except component parts of equipment and items covered by other sections.
- B. Fabricated metal items, which are detailed on the drawings but not mentioned specifically herein, shall be fabricated in accordance with the applicable requirements of this section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Steel Joists - Section 05200
- B. Metal Decking - Section 05300

1.03 REFERENCED STANDARDS FOR QUALITY ASSURANCE

- A. All work shall be in accordance with the applicable sections, and references therein, of the Specifications and Standards of the following:
 - 1. Manual of Steel Construction by American Institute of Steel Construction (AISC).
 - 2. American Society of Testing Materials (ASTM)
 - 3. American Welding Society (AWS)
 - 4. Steel Structures Painting Council (SSPC)
 - 5. Welded Steel Tube Institute (WSTI)
- B. In conflicts between this specification, industry standards and/or local building codes, the more stringent requirements shall govern.

1.04 SUBMITTALS

- A. Shop drawings in accordance with project procedures showing all dimensions, locations, connection details, notes, accessories, and other materials related to the furnishing, fabricating, testing, painting and erection of the structural steel required by these specifications.
- B. Shop drawings shall show complete bolting and welding information, both shop and field, using appropriate symbols.
- C. Shop drawings shall not be made by reproduction of design drawings. Steel erection drawings and detail sheets prepared by steel fabricator shall all be of the same size sheets and approximately the size of the design drawings.
- D. Shop drawings shall be reviewed for conformance to specific project requirements by the contractor before being submitted to the Engineer for approval.

PART II - PRODUCTS

2.01 MAIN, SECONDARY MEMBERS & BASE PLATES

- A. Rolled Sections - ASTM A-992, $F_y=50$ ksi.
- B. Steel Pipe - ASTM A-501, $F_y=36$ ksi.
- C. Tube Sections - ASTM A-500, Grade "B", $F_y=46$ ksi or Grade "C", $F_y=50$ ksi.

2.02 BOLTS

SECTION 05100 - STRUCTURAL STEEL

- A. Bolted shop and field connections shall be made with high strength, friction type nuts and washers conforming to ASTM A-325 or A-490. Bolts shall have an identifying mark of three (3) radial lines.
- B. Non-friction bolt connections may be with bolts conforming to ASTM A-307.
- C. All bolts shall be 3/4" diameter unless otherwise shown on drawings.

2.03 WELDING ELECTRODES

- A. All welding electrodes shall be E-70 series.

2.04 PAINT

- A. Unless otherwise noted shop coat paint may be fabricator's standard but shall be compatible with final field painting. Touch-up paint used in the field shall be the same type paint used for the shop coat and shall be delivered to the job in sealed containers clearly marked with manufacturer's name and brand.
- B. Finish paint shall be as specified elsewhere in this specification.
- C. Lintels shall receive two coats of shop paint before placing.

2.05 GROUT

- A. Grout for base plates shall be a ready-to-use, non-metallic, non-corrosive product requiring only addition of water at job site to produce a flowable grouting material having no drying shrinkage at any age. Compressive strength of grout shall be not less than 5000 psi at 28 days.

PART III - EXECUTION

3.01 FABRICATION

- A. Fabricate from approved shop drawings using members cut from full-length stock. Members may be spliced only where shown.
- B. Members shall be free from twist, bends, buckles or open joints.
- C. Shop connections may be bolted or welded. Welds, bolt size, number and spacing shall be determined by the AISC Standards. Fabricator shall design and be responsible for all connections. Connections for beams which cannot conform to the typical connection details shall be in accordance with the following:
 - 1. Where beam reactions are not shown on the drawings connection details shall be detailed for the end reaction resulting from the maximum uniform load which the beam will support (as simple beam) for the span on the drawing.
 - 2. Where beam reactions are shown on the drawings, the connections shall develop the reactions shown.
 - 3. Where connections are subject to eccentricity, such eccentricity shall be taken into account when detailing the connections.
- D. Bearing surfaces shall be planed to true beds. Abutting surfaces shall be closely fitted. Tubular sections shall be completely seal-welded at all joints, seams, and splices.
- E. Structural steel shall be provided with all holes for attaching wood, masonry, furring, sash angle clips and other parts.
- F. Fascia beams and other steel requiring accurate alignment shall be provided with

SECTION 05100 - STRUCTURAL STEEL

slotted holes and/or washers for aligning the steel accurately. No erection bolts or other fastening parts or joints or rolled stamping names shall show on finished surfaces of exposed steel, exterior or interior.

- G. Lintels shall have 8" minimum bearing each side of opening.
- H. Shop connections may be welded except as noted. Field connections shall be welded or made with the high strength steel bolts except for girts, stair stringers and handrails which may be field bolted with machine bolts. All welding shall be done by operators qualified by AWS Standards. Certificate shall be furnished when requested. Welding techniques, appearance and quality shall conform to AWS Standards. Continuous jet welding may be employed at all exposed connections requiring a smooth weld in lieu of conventional welds that require grinding.

3.02 SHOP PAINT

- A. All steel shall be shop cleaned per SSPC-SP3 and primer paint applied immediately thereafter. Except for steel to be field welded, surfaces shall be covered evenly and thoroughly and worked into joints. Paint shall be applied to dry surfaces. Parts inaccessible after assembly shall be given two (2) coats of the specified shop paint.
- B. Shop primer shall have a minimum dry film thickness of 1.2 mils.
- C. Contact surfaces shall be cleaned before assembly but shall not be painted. Machine finished surfaces shall be protected against corrosion by a suitable coating.

3.03 STORAGE OF MATERIAL

- A. Site storage of all structural steel shall be as directed by the job superintendent.
- B. All steel shall be stored on blocking so that no metal touches the ground and will be protected against bending under its own weight and water will not collect thereon.

3.04 ERECTION

- A. Steel shall be erected level and plumb within AISC tolerances. No final bolting or welding shall be done until structure is properly aligned. The structure shall be secured against all dead load, wind and erection stresses. Temporary bracing shall be used where necessary and shall remain in place as long as required for safety.
- B. Bolting shall be done with high strength friction type bolts and hardened washers. Set high strength bolts by the turn-of-the-nut method as specified by the "Research Council On Riveted and Bolted Structural Joints".
- C. Holes for turned bolts to be inserted in the field shall be reamed in the field. Erection bolts are not to be used on exposed surfaces. Erection bolts or other surfaces and stiffeners shall not interfere with architectural clearances.
- D. No additional holes or cutting of steel work other than shown on the Drawings shall be done without the written permission and approval of the Owner's representative.
- E. Light drifting necessary to draw the holes together will be permitted, but drifting to match unfair holes will not be allowed. Twist drills shall be used to enlarge holes as necessary to make connections. Reaming that weakens the members or makes it impossible to fill the holes properly or to adjust accurately after reaming will not be allowed. Enlarging holes by burning is prohibited.
- F. Welding - See Paragraph 3.01 H - Protect all adjacent finished surfaces during the progress of welding. Damaged surfaces shall be replaced at cost of the erection

SECTION 05100 - STRUCTURAL STEEL

contractor.

3.05 FIELD PAINTING (TOUCH-UP)

- A. After the structural steel has been erected and before any superimposed construction is placed, apply one field coat of paint to all places where the shop coat of paint has rubbed away; where the shop coat of paint was omitted because of field welding, or where field welding has damaged the shop coat of paint. Apply field paint to the structural steel and bar joists before roof deck is applied.
- B. Touch-Up Paint - After erection is completed, all field bolts, field welds, abrasions, etc. shall be cleaned and spot painted. Paint shall be same material used for the shop coat and shall be applied evenly with no runs, etc.

3.06 FIELD QUALITY CONTROL

- A. The steel contractor shall secure the services of a testing laboratory as approved and accepted by the local authorities and the owner/engineer to provide qualified inspectors for the following inspections.
 - 1. All shop and field connections
 - 2. Qualifications of welders
 - 3. Daily calibration of impact wrenches used for high strength bolting
 - 4. Visual inspection of all work after erection
- B. Testing agency shall interpret tests and state in each report whether test specimens comply with requirements and specifically state any deviations therefrom.
- C. Costs of all inspections shall be paid for by the steel contractor. Testing laboratory shall send reports of all inspections directly to the engineer and owner and elsewhere as directed.
- D. Bolted connections shall be tested for minimum fastener tension for bolt size and grade specified in conformance with the AISC. Inspection for tightness shall be the arbitration method thus:
 - 1. Ten percent (10%) of all bolted connections, but not less than two (2) bolts (selected at random) in each connection shall be tested. Test shall be made with an "inspecting wrench" adjusted to "job inspection torque". If no nut or bolt head is turned, the connection shall be accepted. If any nut or bolt head is turned, all bolts and nuts in the entire connection shall be tested. Contractor shall tighten all bolts in any connection in which a test bolt failed and resubmit the connection for re-inspection. All costs for re-tightening of bolts shall be borne by this Contractor.
- E. Welded connections may be inspected visually unless otherwise noted on contract drawings. However if any weld appears inadequate the engineer can require magnetic particle or ultrasonic testing without any additional cost to owner.

3.07 CLEAN-UP

After the completion of this work, remove from the site all excess materials and debris. Leave entire work in a neat and orderly condition ready for inspection.

END OF SECTION

**DUPONT SOCCER COMPLEX
CHATTANOOGA, TN**

MECHANICAL SPECIFICATIONS INDEX

- SECTION 15010 – GENERAL PROVISIONS
- SECTION 15025 – COMPLETION ITEMS
- SECTION 15030 – GUARANTEE
- SECTION 15050 – BASIC MATERIALS AND METHODS
- SECTION 15051 – PIPE, PIPE FITTINGS, AND VALVES
- SECTION 15060 – STRUCTURAL AND MISCELLANEOUS METALS
- SECTION 15075 – MECHANICAL SUPPORTING DEVICES
- SECTION 15090 – MECHANICAL SYSTEMS INSULATION
- SECTION 15100 – ELECTRIC HEAT TRACING FOR PIPELINES
- SECTION 15200 – DOMESTIC WATER SYSTEM - INDOORS
- SECTION 15300 – SOIL, WASTE AND VENT SYSTEM - INDOORS
- SECTION 15400 – PLUMBING FIXTURES AND TRIM
- SECTION 15742 – ELECTRIC HEATING EQUIPMENT
- SECTION 15790 – EXHAUST FANS
- SECTION 15840 – DUCTWORK
- SECTION 15900 – AUTOMATIC CONTROLS

SECTION 15010 - GENERAL PROVISIONS

PART I - GENERAL

- 1.01** The A.I.A. General Conditions, Supplementary conditions and Special conditions of the Contract for the construction of building are to be considered as a part of this specification and all conditions contained therein which may affect this work are as binding as though contained herein.
- 1.02** The intent is to obtain a complete installation to which end the Contractor shall furnish all material, equipment, labor, etc. specified and any other accessory items which may not be specified, but which normally are furnished, required for proper operation or can be reasonably implied from the specifications and plans. The Contractor shall furnish all freight, drayage, rigging, etc. required for this work.
- 1.03** In this section, the word "Contractor" or "This Contractor" means the contractor who is engaged to execute that portion of the work under which the word is shown.
- 1.04** The word "Provide" means to furnish, install, and connect.
- 1.05 WORK INCLUDED**
- A. The work to be performed under the Heating, Ventilating, and Air Conditioning Contract shall include, but not be limited to:
 - 1. All ductwork complete with all accessories
 - 2. Exhaust fans
 - 3. Automatic controls
 - B. Plumbing work shall include, but not necessarily be limited to the following major items:
 - 1. Soil, waste and vent piping
 - 2. Cold and hot water supply piping
 - 3. Plumbing fixtures complete with all accessories
 - 4. Thermal insulation as herein specified
- 1.06 WORK NOT INCLUDED**
- 1. Furring around pipes, ducts, etc.
 - 2. All electrical power wiring, conduit, etc. for electric heaters, motors, and motor starters shall be installed by Electrical Contractor
 - 3. Undercutting of doors and installation of door grilles
 - 4. Painting, except as required in Section 15025
- 1.07 CODES, LAWS AND ORDINANCES**
- A. Contractor shall comply with all laws, codes and ordinances, etc. having jurisdiction over the work involved, except where the requirements called for in drawings and specifications are in excess of those called for in said laws, codes, etc.
 - B. Perform work in accordance with the standards listed below, except where Federal, State, or Local Codes are more stringent, in which case follow same:

American Society for Testing and Materials

ASTM

SECTION 15010 - GENERAL PROVISIONS

National Fire Protection Association	NFPA
Sheet Metal & Air Conditioning Contractor's Association	SMACNA
Local Building Code	
Local Mechanical Code	
Local Plumbing Code	
Owners Insurance Underwriter	

- C. Any changes necessary in order that the work comply with all such codes, laws, ordinances, etc., shall be made by the Contractor, with the approval of the Architect's Engineer, and without additional cost to the Owner.
- D. The Contractor shall obtain permits, inspection certificates, etc., required and give them to the Owner upon request before final payment.

1.08 PLANS AND SPECIFICATIONS

- A. While drawings are to scale, they are diagrammatic. Equipment, piping, outlets, etc. are not exactly positioned; therefore the Contractor shall refer to architectural drawings for actual building dimensions and work by other trades. Do not scale drawings.
- B. The right is reserved to move any outlet, equipment, and related ducts, controls, piping, etc., as much as ten feet at no increase in cost provided the Contractor is notified of the change before work on the detail in question is started.
- C. It shall be the responsibility of this Contractor that the equipment he installs fits the space available, leaving reasonable space for maintenance and servicing of equipment. If, after the installation of any equipment, piping, etc., it is determined that the space requirements have not been met, the Contractor shall rearrange the work at no extra cost to the Owner.
- D. EXISTING CONDITIONS: This Contractor is to visit site PRIOR TO BID to become completely familiar with existing systems, conditions and location of work affected by the plans and specifications. Failure to observe existing conditions shall not relieve the Contractor from providing a complete and properly operating system or from providing offsets, fittings, interlocks, accessories, etc. which may be required for new and existing systems.

PART II - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new and the best grade and shall conform to all standards and requirements governing the work. Equipment and materials damaged during the installation shall be replaced immediately at no extra cost to the Owner.
- B. Manufacturer's names, catalog numbers, etc. used herein are to denote design, workmanship, and quality desired. Materials and equipment of other manufacturers, when conforming to the specifications, and when proved to be equal to the material specified, will be approved. This paragraph shall be considered as applying throughout.
- C. Where applicable, the equipment shall carry the label of the Underwriter's Laboratory, Inc.

SECTION 15010 - GENERAL PROVISIONS

2.02 SHOP DRAWINGS

- A. The Contractor shall submit, for approval by the Architect's Engineer, six sets of brochures describing each item required. Description shall include rated capacities, dimensions, and characteristics. This information shall be submitted before procurement. Mark sheets with model numbers and options being proposed, identified with same designation as used on plans.
- B. ALL BROCHURES AND DRAWINGS SHALL BE SUBMITTED AT ONE TIME. Items not approved shall be resubmitted with the necessary corrections made and shall be resubmitted until final approval is obtained.
- C. On request from the Engineer, the Contractor shall submit samples of material and equipment.
- D. Equipment substitutions, which affect structural, architectural, electrical or any other trade will be the sole responsibility of the Contractor. Any additional work required by other trades for proper installation shall become the responsibility of the Contractor whose work was substituted. Shop drawing approval shall not relieve the Contractor from compliance.

2.03 MACHINERY GUARDS

- A. Provide guards for moving equipment such as fan belt drives, pump/motor drive couplings and etc.
- B. Use OSHA approved belt guards and coupling guards. Provide ½ inch hole in guard at center shaft of driven equipment where belt type drives are used.

2.04 BOLTED CONNECTIONS

- A. Accurately punch, drill or ream bolt holes and remove burrs. Use washers, lock washers and self-locking nuts as required. Tighten all bolts and nuts. Use screw threads conforming to the National or Unified forms in accordance with the Bureau of Standards Handbook H28. Do not use sheet metal screws. For connections other than ductwork, use machine bolts where access or nuts would not be possible, and where unbolting may be required, in which case utilize sufficient thickness of metal to assure that 2 complete bolt threads are engaged. Secure machine bolts in place by proper lock washers.

SECTION 15010 - GENERAL PROVISIONS

PART III - EXECUTION

- 3.01** All work shall be carried out in a neat and orderly manner by experienced mechanics, and under constant supervision of a competent mechanic, trained and licensed in this field, who shall represent this Contractor at all times in connection with the work.
- 3.02** When the Architect's Engineer rejects materials or work, the Contractor shall remove all rejected work and/or material at no extra cost to the Owner.
- 3.03** When this work damages other material, equipment, etc. his Contractor shall make all needed repairs, which shall be equal to that damaged, in quality, strength, and appearance.
- 3.04** This Contractor shall, in every way, cooperate with the other contractors in the job. Where several trades are involved in any space, area, or pipe chase, all shall cooperate and install their own work to utilize the space between them as their individual needs require. In general, the ductwork shall be given preference except where grading of a pipe becomes impossible. Attention is called to space required by lighting fixtures.

END OF SECTION

SECTION 15025 - COMPLETION ITEMS

PART I - GENERAL

1.01 CONNECTIONS TO EQUIPMENT

- A. This Contractor shall make all connections to equipment furnished under this section of the specifications.
- B. Each fixture and piece of equipment shall be connected into piping systems using unions, or union fittings and service valves on both "in" and "out" connections. Connections to fixtures shall be concealed where possible. Flanged connections do not require unions.
- C. All equipment shall be installed in strict conformance with manufacturer's recommendations, as specified herein and as shown.
- D. All welders shall be qualified by an independent testing agency and certified in accordance with the requirements of ASME Section IX of the Boiler and Pressure Vessel Code. Contractor shall furnish certification of welders qualifications with shop drawings.

1.02 ADJUSTING AND BALANCING

- A. It shall be the responsibility of this Contractor to completely adjust and balance the system to provide performance desired. He shall furnish the Owner with clean copies of all instrument readings and quantities leaving and entering units, in main trunks, outside air intakes and reliefs, exhaust fan main branches and each inlet, delivery from supply registers, and return registers, fan motor running amperage and rated full load amps, etc. Air quantities shall be balanced to within 5% of those shown on drawings.

PART II - PRODUCTS

2.01 RECORD DOCUMENTS

- A. The Contractor shall furnish the Owner with one complete set of reproducible drawings and two complete, clean sets of specifications showing installed locations, size, etc., of all work and material as taken from record documents.
- B. Provide three sets of 1.) Manufacturer's operating and maintenance instructions for each piece of equipment and 2.) Terminal-to-terminal automatic control diagram showing all wiring and interlocks. Bind this information into 8½" x 11" booklets.

PART III - EXECUTION

3.01 CLEANING

- A. This Contractor shall clean all equipment and accessories free from rust, grease, plaster, etc. before being placed in operation.
- B. Units being run during the construction process shall be provided with clean filters. Filters shall be checked and changed during this time. Upon final acceptance change filters.

3.02 PAINTING

- A. This Contractor shall paint all piping, equipment, supports, and other ferrous metal which is not otherwise protected against corrosion. When factory paint has been damaged, it shall be touched-up to give an appearance similar to adjacent

SECTION 15025 - COMPLETION ITEMS

surface. Clean thoroughly all surfaces before painting.

- B. Rusted work shall be wire brushed free of rust and primed with rust inhibitive primer as directed.

3.03 MARKING

- A. This Contractor shall label all relays, valves, thermostats, equipment, switches, etc. Labeling of equipment other than valves shall be done with engraved plastic signs showing white letters on red background. Valves shall be labeled with valve tags. Tag numbers shall correspond to a valve listing which shall list function, area or equipment served and normal position. This listing shall be mounted under glass as directed.
- B. Piping shall be marked 20 feet on center for straight runs in open areas and 10 feet on center in mechanical rooms and closed areas. Vertical lines shall be labeled minimum one per floor. Pipe identification shall be "Seaton Name Plate Corporation", "Setmark" or equal in appearance by contractor with the following designations:

PIPE	COLOR
1. Water	GB
2. Domestic Hot Water	Y

Note: Y = Yellow with Black Letters; GB = Green with Black Letters

3.04 OPERATION TEST AND INSTRUCTIONS

- A. Give all equipment furnished under this Contract an operational test prior to final acceptance. Notify Engineer 48 hours in advance of these tests. Failure to notify the Engineer will require these tests be repeated if directed.
- B. This Contractor shall instruct Owner's representative on the proper care, operation, and control of system if necessary for up to two eight-hour days.

END OF SECTION

SECTION 15030 - GUARANTEE

PART I - GENERAL - NOT USED.

PART II - PRODUCTS - NOT USED.

PART III - EXECUTION

- 3.01** This Contractor shall, and hereby does, warrant, and the General Contractor shall, and hereby does, guarantee, that all work executed under this section of this specification will be free of defects of materials and workmanship for a period of one year from the final acceptance of the building. The above parties further agree that they will, at their own expense, repair and replace all such defective work and all other work damaged thereby which becomes defective during the term of this guarantee.
- 3.02** Contractor shall furnish first charges of refrigerant, grease, oil, etc., and shall be responsible for such full charges during the guarantee period, except when loss is due to negligence or fault of the Owner.

END OF SECTION

SECTION 15050 - BASIC MATERIALS AND METHODS

PART I - GENERAL

1.01 WORK DESCRIPTION

- A. Provide all labor, materials, and equipment required to complete installation as specified herein and shown on plans.

PART II - PRODUCTS

2.01 ELECTRICAL EQUIPMENT

- A. Motor controllers, starters, protective devices, etc. for control and protection of equipment shall be furnished with the equipment. Installed by Mechanical Contractor and electrically connected to power source under "Electrical Division".
- B. Provide both overload and under voltage protection in all phases. Where interlock or automatic operation is specified, regardless of HP, provide magnetic starter complete with "run-off-auto" switch so connected that in "run", all safety controls can stop the motor.
- C. Size two and larger starters shall have control circuits individually fused from line side of starter.
- D. Motors $\frac{1}{2}$ HP and smaller, 120 volts, single phase, (unless noted otherwise). Motors $\frac{3}{4}$ HP and larger, 3 phase voltage as noted. Motors shall be rated for continuous, full-load duty and be capable of withstanding momentary overloads of 50 percent.
- E. Provide dual element fuses for all hermetic motors above $\frac{3}{4}$ HP.
- F. NEMA Standards shall be taken as minimum requirements for electrical equipment.
- G. Contactors shall be UL listed for 100,000 cycles of operation.
- H. Where starters are in outdoor conditions, contractor to furnish NEMA 3R enclosure with ambient compensating heaters.

PART III - EXECUTION

3.01 ELECTRICAL WORK

- A. All electrical power wiring shall be done under Division 16. All control devices, starters, wiring, contactors, etc. shall be provided and installed by Division 15.
- B. Control wiring shall be by Mechanical Contractor. All electrical work shall comply with requirements set forth in Division 16. Minimum control wiring sizes shall be #12 AWG for 120 volts or higher, and #18 AWG for low voltage wiring which shall both be run in conduit.
- C. The Contractor shall verify the available electrical characteristics before ordering equipment.

3.02 EXCAVATION AND BACKFILL

- A. This Contractor shall do all necessary excavation required for installation of his work. Each utility shall have its own trench.
- B. Excavation for piping shall be cut a minimum of 6" below the required grade and a 6" bed of sand or unclassified gravel back-filled to serve as the bedding for the pipe.

SECTION 15050 - BASIC MATERIALS AND METHODS

- C. Where trenches are over 5'-0" in depth, sides shall be shored up to prevent cave-in during construction. Remove all timber before starting to backfill.
- D. After work has been tested and approved, the Contractor shall backfill all trenches. Backfill shall consist of a layer of washed gravel to 12" above the pipe, and dirt fill, free from rocks, debris, and cinders. Where ductile iron pipe is shown or specified, backfill shall be dirt only as described above.
- E. Install backfill material in 12" layers. Compact to 95% standard proctor. If more stringent, compact backfill to a dry density equal to that required by Contract for the location.

3.03 CUTTING AND PATCHING

- A. The General Contractor shall provide new openings in new construction required by this Division. This Contractor is responsible for location and size of openings required by his work. This Contractor is solely responsible for providing all pipe sleeves, sealing of openings, and all openings required for his work in existing construction.
- B. All other cutting, patching, and drilling for the installation of this work shall be provided under this Division.
- C. Structural members shall not be cut without prior approval of the Architect.
- D. Patching shall be of quality equal to, and in appearance, matching existing construction, and shall be performed under the Section of the specifications covering these materials.

3.04 FLASHING

- A. All piping passing through roof shall be flashed with a flashing fitting approved by the roofing manufacturer. Flashing shall be of size to match pipe served.
- B. Offset pipe under roof so no roof penetration is closer than 48" to roof edge.
- C. Make roof drains watertight with 4 lbs. per square foot sheet lead extending at least 12" from drain rim into membrane waterproofing and clamped to drain.

3.05 MINIMUM REQUIREMENTS

- A. Code requirements are minimum and shall be complied with at no additional cost. Where requirements of these drawings and specifications exceed code requirements, work shall be furnished and installed in accordance with drawings and specifications. Any work done contrary to the requirements shall be removed and replaced without incurring additions to the contract.

3.06 FREEZE PROTECTION

- A. Inspect all drawings carefully for locations subject to freezing conditions. Do not install piping in exterior walls, ventilated attic or ceiling spaces, or other locations where freezing may occur unless otherwise noted in the plans.
- B. Piping systems throughout the building shall be protected from freezing, generally by installing pipes on the heated side of building insulation. Piping adjacent to exterior walls shall be installed in furred spaces with building insulation between the piping and the exterior wall.

END OF SECTION

SECTION 15051 - PIPE, PIPE FITTINGS, AND VALVES

PART I - GENERAL

- 1.01** Where the word "piping" is used, it shall mean pipes, fittings, nipples, valves, and all other accessories as required for continuous and complete systems of piping.
- 1.02** Use latest edition of "Standards" or "Federal Specifications".

PART II - PRODUCTS

- 2.01** Black steel pipe shall conform to ASTM A120. Fittings for pipe up to 2½" shall be screwed type. Fittings for pipe 3" and over shall be welding type fittings. Fittings shall meet the following:
- A. Malleable Iron: ASA - B-16-3
 - B. Cast Iron: ASA - B-16-4
 - C. Welding Type: ASA - B-16-9
- 2.02** Galvanized steel pipe shall be ASTM A120 hot-dipped per ASTM A120. Fittings as above, except hot-dipped galvanized drainage type.
- 2.03** Copper pipe and fittings shall conform to ASTM B88 specifications for hard drawn pipe and ASTM B-280 for soft annealed copper tubing. Tubing shall be marked for type identification. Fittings shall be wrought, solder sweat type. For potable water systems joints shall be sweat soldered using 95-5 solder with water-soluble flux approved for potable water systems. Use 95-5 solder with "Nokorode" flux for all other applications.
- 2.04** Bell and spigot cast iron soil pipe and fittings shall comply with ASTM Standard A-74 and shall be coated inside and outside. Joints shall be made with positive seal elastomeric compression type gaskets.
- 2.05** No-Hub cast iron pipe and fittings shall comply with the Cast Iron Soil Pipe Institute Standard 301-69-T and shall be coated inside and outside. Joints shall be made with neoprene gaskets meeting ASTM C-564 and stainless steel couplings.
- 2.06** PVC-DWV piping for use outside and within building shall meet ASTM-D-2665. Joints shall be made with solvent cement meeting ASTM 2564. Pipe, fittings, and solvent cement shall carry the NSF seal of approval.
- 2.07** Ductile iron, pipe and fittings shall conform to ANSI/AWWA C150/A21.50 with "Tyton" joints for straight lengths, mechanical joints at fittings, and restraint devices where rodded.
- 2.08 SLEEVES**
- A. Floor, non-bearing walls - 22 gauge galvanized steel.
 - B. Bearing walls above ground - galvanized steel pipe.
 - C. Foundations, underground walls - extra heavy cast iron pipe.
 - D. See detail for vented underground gas piping.
- 2.09 ESCUTCHEONS**
- A. Exposed in finished areas: chrome plated with SETSCREW.
 - B. Exposed in unfinished areas: Steel plates anchored to wall or cast brass with SETSCREW.

SECTION 15051 - PIPE, PIPE FITTINGS, AND VALVES

2.10 VALVES shall be as follows (or equal):

- A. Gate: Milwaukee 1149
- B. Globe: Milwaukee 1502
- C. Check: Milwaukee 1509
- D. Angle: Milwaukee 504
- E. Ball: Watts B5901
- F. Hose Bibbs: Chicago #293 with vacuum breaker, ¾" size.
- G. Non Freeze Hydrants: Josam-Box #71000, Wall #71050. Indoor Hydrant. Josam #71020.
- H. Gas Cock: DeZurik #425 with RS49 seal and #483 lever.
- I. Butterfly: Centerline # AO12105-01
- J. Triple Duty: Amtrol #TD
- K. Diverting: Centerline series A 8" C.I. tee w/#30300 double acting, bello-frame type 80 positioner 3-15# (pneumatic).
- L. PRV: Wilkins 500C sizes 1/2" to 2", Wilkins 500FC sizes above 2".
- M. Reduced pressure backflow preventor: Wilkins 975SLX-AG.

PART III - EXECUTION

- 3.01 Arrange and install piping approximately as indicated, straight and plumb, and as directed as possible, forming right angles or parallel lines with building walls.
- 3.02 Locate groups of pipes parallel to each other, spacing them a distance to permit applying full insulation and to permit access to service valves.
- 3.03 All piping shall be installed to allow for movement due to expansion and contraction.
- 3.04 Do not locate water lines above electrical equipment.
- 3.05 Where changes in pipe size occur, use only reducing fittings. Where dissimilar piping joins, use dielectric fittings.
- 3.06 Ream pipe out, turn on end, and wipe clean before installing cut piping.
- 3.07 Screwed joints shall be made tight, metal to metal, using "Teflon" tape.
- 3.08 No exposed piping used about plumbing fixtures shall show tool marks or more than two threads at fittings.
- 3.09 Sleeves shall be two sizes larger than pipe when uncovered and one pipe size larger than overall outside diameter of pipe and insulation when covered. All penetrations through masonry walls shall be core drilled and sleeved. Sleeves are required where a pipe passes through a wall or floor. Pipes passing through a wall or floor must be individually sleeved unless approved by Architect.
 - A. Sleeves shall finish flush with the finished wall and ¼-inch above the finished floor (NO SHARP EDGES).
- 3.10 Provide escutcheons wherever exposed pipes, hanger rods, etc. pass through floors, walls, and ceilings. Escutcheons shall fit OD. of insulation.

SECTION 15051 - PIPE, PIPE FITTINGS, AND VALVES

- 3.11** Piping specified for use within building shall extend a minimum of 5'-0" beyond building walls, unless otherwise noted.
- 3.12** On black steel gas piping exposed to weather, areas with damaged coating and welded or screwed joints to be wire brushed free of rust, primed with "Rustoleum" oxide primer and sprayed with 2 (two) finish coats of black enamel.
- 3.13** Rough-in locations shall be in accordance with manufacturer's instructions except where piping or escutcheon will interfere with items such as bases around walls. Piping interfering with bases will be removed and relocated.
- 3.14** All piping in finished areas of building shall be concealed except where otherwise noted on the drawings.
- 3.15 VALVES**
 - A. All valves shall be installed so that they are easily accessible for operation and maintenance. Where valves are indicated in any concealed area, offset close to surface of material and install a metal, locking access door of adequate size to service valve. Engineer shall approve exact location prior to installation.
 - B. Valves shall be installed with stems vertical.
 - C. Where valves are located outside building, provide a reinforced concrete valve box with cover or a three-piece cast iron valve box. All covers shall be secured to body with vandal-proof screw.
 - D. Use ball valves for all domestic water lines 2" and below, and gate valves for 2 ½" and larger.

END OF SECTION

SECTION 15060 - STRUCTURAL AND MISCELLANEOUS METALS

PART I - GENERAL

1.01 SCOPE

- A. This section covers all items fabricated from metal shapes, plates, sheets or rods and all other wrought metal for use in support of piping.
- B. Fabricated metal items, which are detailed on the drawings but not mentioned specifically herein, shall be fabricated in accordance with the applicable requirements of this section

1.02 QUALITY ASSURANCE

- A. Regulations, References and Standards: The latest edition of the following regulations, standards, etc. are hereby included in and made part of these specifications.
1. American Institute of Steel Construction (AISC): "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings". "Code of Standard Practice for Steel Buildings and Bridges". This code shall be available at all times for reference.
 2. American Society for Testing and Materials (ASTM): "Standard Specification for Structural Steel" designation A-36, and "Specifications for Structural Joints" using ASTM A-325.
 3. American Welding Society (AWS): "Code for Welding in Building Construction" AWS D1.0-69, and all ARC welding electrodes shall meet the provisions of Section 412, 417 or 418 of AWS D1.0-69 as applicable.

1.03 SUBMITTALS

Submit shop drawings showing all material and connections of all items for approval.

PART II - PRODUCTS

2.01 BASIC MATERIALS

- A. All materials shall be new and undamaged and shall conform to pertinent AISC, ANSI, ASTM or other industry standards. Unless specified otherwise in other specification all sections, materials in fabricated metal items shall conform to the following requirements:
- B. Steel
- | | | |
|----|-------------------|------------------------------|
| 1. | Plates and Shapes | ASTM A 36 |
| 2. | Pipe | ASTM A 53, Grade B, seamless |
| 3. | Bolts | |
| | High Strength | ASTM A 325 |
| | Flat Washers | ANSI B27.2 |
- C. ARC welding electrodes shall be E70 series (AWS). Grade C, Class
- D. Shop Coat Paint - Refer to Section 15050.

2.02 FABRICATION

- A. All members shall be free from twist, bends, buckles, or open joints. Parts assembled with bolts shall be in close contact, except where separators are required. All members shall be so accurately made and spaced that when assembled, the parts shall come together and bolts enter without distortion.

SECTION 15060 - STRUCTURAL AND MISCELLANEOUS METALS

- B. Connections Standard AISC, latest edition, specifications shall be used in determining the connections, unless otherwise shown on the drawings, including the number of bolts and spacing required. All connections shall be bolted or welded and shall not interfere with architectural clearances. The best shop practices shall be followed for shearing, punching, diameter of bolt holes, spacing machine riveting, welding, etc.
- C. Bearing surfaces shall be planed to true beds. Abutting surfaces shall be closely fitted. Tubular sections shall be completely seal-welded at all joints and seams.
- D. Structural Steel shall be provided with all holes for attaching pipe attachments.
- E. Steel requiring accurate alignment shall be provided with slotted holes and/or washers for aligning the Steel accurately. No erection bolts or other fastening parts or joints or rolled stamping names shall show on finished surfaces of exposed Steel, exterior or interior.
- F. Welding - All welding except to existing Steel shall be performed in shop. Refer to Section 15050.

PART III - EXECUTION

3.01 ERECTION, INSTALLATION AND APPLICATION

- A. Erection shall include the setting and erection of all Structural Steel. The frame shall be erected true and plumb. Temporary bracing shall be used wherever necessary to take care of all loads to which the structure may be required for safety. As erection progresses, the work shall be securely bolted up to take care of all dead load, wind and erection stresses. Steel shall be erected level or plumb within a tolerance as recommended by AISC Code of Standard Practice.
- B. No final bolting or welding shall be done until each portion of the structure has been properly aligned. Bolting shall be done with high strength friction type bolts and hardened washers, using properly calibrated and inspected torque tension wrenches. Bolts marked after tightening. Bolts shall be drawn-up tight and threads set so that nuts cannot become loose. Set high-strength bolts by the turn-of-the-nut method. Holes for turned bolts to be inserted in the field shall be reamed in the field. Erection bolts are not to be used on exposed surfaces. Erection bolts or other surfaces and stiffeners shall not interfere with architectural clearances.
- C. Protect all adjacent finished surfaces during the progress of welding. Damaged surfaces shall be replaced at the cost of the erection contractor.

3.02 FIELD QUALITY CONTROL

- A. Field errors shall not be corrected by burning, except with the permission of the engineer.
- B. Inspection for tightness shall be the arbitration inspection method.

END OF SECTION

SECTION 15075 - MECHANICAL SUPPORTING DEVICES

PART I - GENERAL

- 1.01** All materials and equipment shall be properly supported and hung to keep piping, ductwork, and equipment to an even grade throughout its installation. All hangers and supports shall be of ample size to safely support the load imposed and shall be provided complete.
- 1.02** Fasten supports to building in the following order of preference:
- A. Steel Framing
 - B. Concrete
 - C. Wood Framing
 - D. Masonry
 - E. Wood Sheathing
- 1.03** Adhesives are not acceptable as mounting or supporting devices.
- 1.04** All hangers or upper attachments, which are to be supported by structural members, shall attach to the upper chord and at the panel point. In no case shall any load be imposed to bracing, bridging, angle or other portion of the member.

PART II - PRODUCTS

2.01 PIPE

- A. Steel, Cast Iron, or PVC pipe Fee & Mason #103
- B. Copper Pipe (Horizontal) Fee & Mason #500
- C. Copper Pipe (Vertical)

2.02 DUCTWORK

- A. Horizontal - straps in accordance with SMACNA. Wire will not be allowed.
- B. Vertical - over 8'-0" angle support from adjacent surface screwed to duct.

PART III - EXECUTION

- 3.01** Hanger and support spacing for horizontal pipes shall be as follows:
- A. Cast Iron Pipe: 5'-0" or every other joint, whichever is closer.
 - B. Steel Pipe: 7'-0" for pipe 1-½" and smaller and 10'-0" for all other.
 - C. Copper Pipe: 6'-0" for pipe 1-½" and smaller and 10'-0" for all other.
 - D. PVC Pipe: 4'-0" or every other joint, whichever is closer, and at each change in direction.
- 3.02** Support hanger from wood using coach screws on open construction and hanger flanges on sheeting, from concrete using inserts, from steel using beam clamps, rivets, or bolts, and from concrete block using toggle bolts or through bolts.

SECTION 15075 - MECHANICAL SUPPORTING DEVICES

- 3.03** Hangers and supports shall be placed at each offset or change of direction of piping, at end of branches and at risers. Any pipe riser exceeding 8 feet shall have riser clamps 6 feet on center.
- 3.04** Where supports are required by in-line pumps, plumbing fixtures or other pieces of equipment, contractor to furnish supports compatible and intended for equipment.
- 3.05** The Contractor shall provide all equipment supports and upper structural materials required by equipment which he furnishes that is to be suspended from framing members, bracketed on walls, or supported clear of floor and roof.
- 3.06** Provide pipe clamps behind each supply line to fixtures, on outside of insulation, to prevent movement in any direction. Flush valves, stops, etc. which have movement will be corrected by installing clamps behind wall. Escutcheons shall not be considered a clamping device.
- 3.07** "Unistrut" support system and pipe clamp to be of adequate size for placement of ½" "Armaflex" or equal at point of clamp. Install Armaflex at each clamp, extending ½" each side with neat appearance.
- 3.08** Pipe hangers for suspending horizontal insulated piping shall be sized to fit around the pipe, pipe insulation and pipe insulation shield (if any).

END OF SECTION

SECTION 15090 - MECHANICAL SYSTEMS INSULATION

PART I - GENERAL

- 1.01** Entire insulation system, including insulation, jackets, finishes, adhesives, shall be U.L. listed as non-combustible. Flame spread rating shall be less than 25, fuel contributed less than 50 and smoke generated less than 50.
- 1.02** Provide a complete and CONTINUOUS installation of insulation from equipment, device or fixture to main service entrance or point of discharge.

PART II - PRODUCTS

2.01 PIPING

- A. Owens-Corning "One-Piece" fiberglass pipe insulation with FRJ jacket with self-sealing lap.
 - 1. Domestic cold water: 1/2" thick.
 - 2. Domestic hot water and hot water recirculating piping above grade: 1" thick.
- B. Vapor barrier adhesive: Foster 30-35.
- C. All exposed piping in mechanical rooms and shall be covered with hard white PVC jacket, 0.20" thick solvent welded as manufactured by Zeston or equal.

2.02 DUCTWORK

- A. Internal Acoustical Liner: Certain-Teed "Ultralite" heavy graduated density, 1" thick.
- B. External Duct Insulation: Certain-Teed Duct Wrap Insulation, 2" thick, with Type LV facing for all other systems
- C. All liner to meet ASTM G21 and G22 for micro-biological treatment.

- 2.03 HANDICAP FIXTURES-** Provide Zurn Z-8996-2 stop/supply and trap protector.

PART III - EXECUTION

3.01 PIPE

- A. Insulation shall have all sides and end joints butted together tightly. Adhere SSL by pressurizing it with a hard tool. Provide 3" butt strips at each end of joint and seal in same manner as longitudinal joints.
- B. All fittings and valves shall be insulated with pre-molded fittings insulation. Coat each fitting with two 1/8" coats of vapor barrier mastic, reinforced with glass fabric extending 2" onto adjacent pipes.

3.02 DUCTWORK

- A. All rectangular supply, outside and return air ductwork shall have internal acoustical liner. Diffuser necks shall be externally insulated.
- B. Boots and boxes for grilles and registers above grade to be externally wrapped, below grade, lined internally.
- C. Acoustical liner shall be cemented to the ductwork by a solid coat of bonding adhesive spread over entire surface. Liner shall be secured with Foster's "Clip-Fas" hangers (one per square foot) in addition to the adhesive.
- D. All round pipe to be wrapped with external insulation and sealed with

SECTION 15090 - MECHANICAL SYSTEMS INSULATION

manufacturer's tape for vapor proof installation. External insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2". Adhere with 4" strips of bonding adhesive at 8" on center, 2" flange in circumferential joint and overlap in longitudinal joints shall be stapled with flare-door staples on 6" centers and taped with 3" wide full reinforced Kraft tape.

- E. Contractor shall provide and install a weatherproof insulation system on all ductwork exposed to outside weather conditions. The system will utilize a 1 ½" thick polystyrene or polyisocyanurate closed cell rigid board insulation with a vapor barrier system equal to Polyguard Products, Inc. Alumaguard 60. All materials will be installed as per the manufacturer's specifications.
- F. The contractor shall provide and install fiberglass insulation with vapor barrier for all ductwork exposed to outside temperature conditions (i.e. attic, crawl space, etc...). The duct system shall be externally wrapped with all longitudinal joints overlapping a minimum of 2". All other joints to be butted and sealed. All materials will be installed as per the manufacturer's specifications.

END OF SECTION

SECTION 15100 - ELECTRICAL HEAT TRACING FOR PIPELINES

PART I - GENERAL

- 1.01** Furnish and install a complete UL listed system of heaters, components, and controls to prevent pipelines from freezing.
- 1.02** All water piping shown on plans exposed to ambient temperatures shall be electrically traced to point of termination to equipment or conditioned space.

PART II - PRODUCTS

- 2.01** The self-regulating heater shall consist of two (2) 16 AWG tinned-copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature all along its length, allowing the heater to be crossed over itself without over-heating, to be used directly on plastic pipe and to be cut to length in the field. The heater shall be covered by a radiation cross-linked modified polyolefin dielectric jacket.
- 2.02** In order to provide energy conservation and to prevent overheating, the heater shall have a self-regulating factor of at least 90 percent. The self-regulation factor is defined as the percentage reduction, without thermostatic control, of the heater output going from 40 degree F pipe temperature operation to 150 degree F pipe temperature operation.
- 2.03** The heater shall operate on line voltages of 120 volts without the use of transformers.
- 2.04** The heater be sized according to the following table. The required heater output rating is in watts per foot at 50 degree F. (Heater selection based on -10 degree F ambient temperature.)

Insulation Thickness on Metal Pipe

Pipe Size	1-inch fiberglass	2-inch fiberglass
2 inch or less	3 watt	3 watt
2-1/2 inch to 4 inch	5 watt	3 watt
5 inch to 6 inch	8 watt	5 watt

- 2.05** The heater shall be XL-Trace as manufactured by Raychem Corporation.
- 2.06** Power connection, end seal, splice and tee kits components shall be applied in the field.
- 2.07** The system shall be controlled by an ambient sensing thermostat set at 40 degree F either directly or through an appropriate contactor.

PART III - EXECUTION

3.01 INSTALLATION

- A. Apply the heater linearly on the pipe after piping has been successfully pressure tested. Secure the heater to piping with cable ties or fiberglass tape.
- B. Apply "electric traced" signs to the outside of the thermal insulation, or outside of jacket where piping is jacketed.

3.02 TESTS

After installation and before and after installing the thermal insulation, subject heat to testing using a 1000 VDC megger. Minimum insulation resistance should be 20 to 1000 megaohms regardless of length.

SECTION 15100 - ELECTRICAL HEAT TRACING FOR PIPELINES

END OF SECTION

SECTION 15110 - SUBMERSIBLE SEWAGE GRINDER PUMP STATION

1.01 GENERAL

- A. Contractor shall furnish all labor, materials, equipment and incidentals required to provide two explosion-proof submersible centrifugal sewage grinder pump(s) for NEC class 1, division 1, group C, D hazardous locations and fiberglass reinforced polyester tank (TRST System). Duplex units, containing two grinder pump and all necessary parts and equipment, shall be installed in fiberglass reinforced polyester tanks for outside installation. All equipment shall be factory installed, except for externally mounted control panel, gravity sewer inlet hubs and pump assembly, which are to be installed in the field.
- B. The contractor shall supply a control panel which contains all necessary components for proper starting and operation of the pumps including start capacitor, start relay, and run capacitors for single Ø pumps. This panel shall provide a circuit that monitors the seal sensors, heat sensors in the pump.
- C. Pump shall be equipped with stainless steel nameplate. An optional name plate stating the unit is accepted for use in NEC Class 1, division 1, group C, D, hazardous locations with third party, (Factory Mutual,) approval.
- D. Each pre-assembled duplex station shall include the basin, basin cover, complete grinder pump, quick disconnect rail system, check valve, junction box, start-stop level controls, motor high temperature shut-off, motor seal leak alarm, high water alarm, all internal wiring terminating into the junction box, shutoff valve, and schedule 80 discharge piping. In addition, an external alarm and pump control panel is to be provided for each unit.
- E. The stations shall be by the same manufacturer as supplying the pump and control panel so as to insure suitability and assurance of experience in matching the equipment required for a complete grinder pumping station together, and to insure single source responsibility for the complete package. All residential stations shall be U.L. listed as an assembly by the manufacturer. The manufacturer shall have a minimum of five (5) years experience in the manufacture and supply of residential grinder stations and shall have a minimum of five thousand (5,000) units installed.

2.01 OPERATING CONDITIONS

- A. Each pump shall be rated 2 H.P., 230 volts, 1 phase, 60 hertz, 3450 R.P.M. The unit shall produce 13 G. P. M. at 97 ft TDH.

3.01 CONSTRUCTION

- A. The pump shall be a centrifugal, submersible, grinder, wastewater type, model G1X as manufactured by Hydromatic Pumps. The pump volute, motor and seal housing shall be high quality gray cast iron, ASTM A-48, Class 30. The pump discharge shall be fitted with a 1¼" NPT flange. All external-mating parts shall be machined and Buna N Rubber O-ring sealed on a beveled edge. Gaskets shall not be acceptable. All fasteners exposed to the pumped liquids shall be 300 series stainless steel.

SECTION 15110 - SUBMERSIBLE SEWAGE GRINDER PUMP STATION

- B. The controls for the pump shall be contained in a non-corrosive fiberglass enclosure meeting NEMA 4X requirements with a hinged door and neoprene gasket.
- C. The enclosure shall have provisions for padlocking. A nameplate shall be permanently affixed to the panel and include the model number, voltage, phase, hertz, ampere rating and horsepower rating. A warning label against electric shock shall be permanently affixed to the outer door
- D. A steel back panel with electroplated bright zinc and clear chromate finish shall be provided. A painted steel back panel will not be acceptable.
- E. Run lights and hand-off-auto switches shall be provided. Run light and hand-off-auto switch shall be mounted on an electroplated bright zinc with clear chromate finish steel bracket. The run light and hand-off-auto switch shall be properly labeled as to function. The hand-off-auto switch shall be rocker type with an electrical life of 50,000 operations. The run light shall match the hand-off-auto switch in appearance and have an electrical life of 5,000 hours. Run light shall be red.
- F. The incoming power shall be 230 volts, 1 phase, 60 hertz service. Terminal blocks with box type lugs shall be supplied to terminate all wiring for floats and heat and seal sensors for the pump, if required. The pump leads shall be terminated at the overload relay or at box type terminal blocks. The terminal blocks for the float connections shall be on the pump controller.
- G. A circuit breaker shall be used to protect from line faults and to disconnect the pump from the incoming power. Circuit breaker shall be thermal magnetic and sized to meet NEC requirements for motor controls.
- H. The magnetic starters shall include a contactor with a minimum mechanical life of 3,000,000 operations and a minimum contact life of 1,000,000 operations. A definite purpose contactor shall not be acceptable. The magnetic starter shall include an overload relay which is ambient temperature compensated and bimetallic. The overload relay shall have test and reset buttons. The overload relay shall be capable of being set in either manual or automatic reset mode. In the manual mode, reset shall be accomplished only by the operator. At 6 times full load amps the overload relay shall trip within 10 seconds or Class 10 rated overload relays shall be required.
- I. Control voltage shall be 120 VAC and may be accomplished by the means of a transformer or available line voltage. A control fuse and on/off switch shall protect and isolate the control voltage from the line.
- J. Wire ties shall be used to maintain panel wiring in neat bundles for maintenance and to prevent interference with operating devices. All wiring shall be color coded to facilitate maintenance and repair of the control panel. Where a color is repeated, number coding shall be added. A schematic shall be permanently attached to the inside surface of the front door.
- K. All ground connections shall be made with ring tongue terminals and star washers to assure proper ground.
- L. Pump controller shall have provisions for connecting float level controls and heat sensor monitors, where applicable, to box type lug connectors.

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- M. Box type lug connectors shall be made of polyamide thermoplastic to exclude aging due to heat influences. Phenolic type terminal blocks on the pump controller shall not be acceptable. Each terminal block shall be property and permanently labeled on the pump controller as to its purpose

3.02 ELECTRICAL POWER CORD

- A. Electrical power cord shall be STW-A, water resistant 600 V, 60°C., UL and CSA listed and applied dependent on amp draw for size.
- B. The power cable entry into the cord cap assembly shall first be made with a compression fitting. Each individual lead shall be stripped down to bare wire at staggered intervals, and each strand shall be individually separated. This area of the cord cap shall then be filled with an epoxy compound potting which will prevent water contamination to gain entry even in the event of wicking or capillary attraction.
- C. The power cord leads shall then be connected to the motor leads with extra heavy connectors having brass inserts with a screwed wire to wire connection, rather than a terminal board that allows for possible leaks.
- D. The cord cap assembly where bolted to the connection box assembly and the connection box assembly where bolted to the motor housing shall each be sealed with a Buna N Rubber O-ring on a beveled edge to assure proper sealing.

3.03 MOTOR

- A. The stator, rotor and bearings shall be mounted in a sealed submersible type housing. The stator windings shall have Class F insulation, (155°C or 311°F), and a dielectric oil filled motor, NEMA B design (3 Ø) NEMA L design (1 Ø). Further protection shall be provided by on winding thermal sensors. Because air-filled motors do not dissipate heat as efficiently as oil-filled motors, they shall not be acceptable.
- B. The pump and motor shall be specifically designed so that they may be operated completely submerged in the liquid being pumped. The pump shall not require cooling water jackets. Dependence upon, or use of, water jackets for supplemental cooling shall not be acceptable.
- C. Stators shall be securely held in place with a removable end ring and threaded fasteners so they may be easily removed in the field without the use of heat or a press. Stators held by a heat shrink fit shall not be acceptable. Stators must be capable of being repaired or rewound by local motor service station. Units that require service only by the factory shall not be acceptable. No special tools shall be required for pump and motor disassembly.
- D. Pump shall be equipped with heat sensors. The heat sensor(s) (one on single phase, two on three phase) shall be a low resistance; bi-metal disc that is temperature sensitive. It shall be mounted directly on the stator windings and sized to open at 120°C and automatically reset at 30-35°C differential. The

SECTION 15110 - SUBMERSIBLE SEWAGE GRINDER PUMP STATION

sensors shall be connected in series with motor starter coil so that the pump cease operation when an over-temperature condition is sensed. The starter shall be equipped with 3-leg overload relay with heaters sized for the pump's full load amps. The pump shall cease operation when the overload is tripped. The overload shall be manually reset.

3.04 BEARINGS AND SHAFT

- A. An upper radial bearing and a lower thrust bearing shall be required. These shall be permanently lubricated by the dielectric oil that fills the motor housing.
- B. The shaft shall be machined from a solid 416 stainless steel bar and is a design that is of large diameter with minimum overhang to reduce shaft deflection and prolong bearing life.

3.05 SEALS

- A. The pump shall have two mechanical seals, mounted in tandem, with an oil chamber between the seals. The upper seal shall be a John Crane Type 21, BF1C1; seals shall be used with the rotating seal faces being carbon and the stationary seal faces to be ceramic. The lower seal shall be a John Crane Type 6A BP892. The seal shall be replaceable without disassembly of the seal chamber and without the use of special tools. Pump-out vanes shall be present on the backside of the impeller to keep contaminants out of the seal area. Units that require the use of foreign manufactured seals shall not be acceptable. Seals shall be locally available.
- B. The pump shall be equipped with a seal leak detection probe and warning system. This shall be designed to alert maintenance personnel of lower seal failure without having to take the unit out of service for inspection or requiring access for checking seal chamber oil level and consistency.
- C. There shall be an electric probe or seal failure sensor installed in the seal chamber between the two tandem mechanical seals. If the lower seal fails, contaminants which enter the seal chamber shall be detected by the sensor and send a signal to operate the specified warning device.
- D. Units equipped with opposed mechanical seals shall not be acceptable.

3.06 IMPELLER

- A. Impeller shall be bronze multi-vane, semi-open non-overloading design and have pump-out vanes on the backside of the impeller to prevent grit and other materials from collecting in the seal area. The impeller shall be designed so that it can factory or field trimmed to meet specific performance conditions. Wear or field trimming shall not deter the factory balance.
- B. Impellers shall be dynamically balanced. The tolerance values shall be listed below according to the International Standard Organization grade 6.3 for rotors in rigid frames.

SECTION 15110 - SUBMERSIBLE SEWAGE GRINDER PUMP STATION

RPM Tolerance

3500 .01 in. - oz./lb. of impeller weight

3.07 CASING

- A. The casing shall be of the end suction volute type having sufficient strength and thickness to withstand all stress and strain from service at full operating pressure and load. The casing shall be of the vertical discharge type. A rail system to allow easy installation and removal of the pump shall be available. The design shall be such that the pumps will be automatically connected to the discharge piping when lowered into position with the guide rails. The casing shall be accurately machined and bored for register fits with the suction and casing covers.

3.08 GRINDER CUTTERS

- A. The combination centrifugal impeller and grinder unit shall be attached to the common motor and pump shaft made of 416 stainless steel. The grinder unit shall be on the suction side of the pump impeller and discharge directly into the impeller inlet leaving no exposed shaft to permit packing of ground solids. The grinder shall consist of two stages. The cutting action of the second stage shall be perpendicular to the plane of the first cut for better control of the particle size. The grinder shall be capable of grinding all materials found in normal domestic sewage, including plastics, rubber, sanitary napkins, disposable diapers, and wooden articles into a finely ground slurry with a particle dimension no greater than ¼ inch. Both stationary and rotation cutters shall be made of 440C stainless steel hardened to Rockwell 60 C and ground to close tolerance.
- B. The upper (axial) cutter and stationary cutter ring shall be reversible to provide new cutting edges to double life. The stationary cutter ring shall be a slip fit into the suction opening of the volute and held in place by three (3) 300 series stainless steel screws and retaining ring. The lower (radial) cutter shall macerate the solids against the I. D. of the cutter ring and extrude them through the slots of the cutter ring. The upper (axial) cutter shall cut off the extrusions, as they emerge from the slots of the cutter ring to eliminate any roping effect, which may occur in single stage cutting action. The upper (axial) cutter shall fit over the hub of the impeller and the lower (radial) cutter shall slip fit and be secured by means of peg and hole and rotate simultaneously with the rotation of the shaft and impeller. A 300 series stainless steel countersunk washer in conjunction shall lock the grinding mechanism to the shaft with a 300 series stainless steel flat head cap screw threaded into the end of the shaft.

3.09 PAINTING

- A. The pump shall be painted after assembly, and testing, with a dark green water reducible air dry enamel. The paint shall be applied in one coat covering all exterior surfaces. The pump shall be air dried after testing and before painting.

3.10 SERVICEABILITY

SECTION 15110 - SUBMERSIBLE SEWAGE GRINDER PUMP STATION

- A. The complete rotating assembly shall be capable of being removed from the volute without disturbing discharge piping or volute. The motor housing, seal housing with seal plate and impeller still attached to the shaft shall be capable of being lifted out of the volute case from the top as one assembly.

3.11 BASIN

- A. The basin shall be 36" diameter with a depth (8') as shown on the plans. The basin shall be molded of fiberglass reinforced polyester resin manufactured by the filament wound technique to assure that the interior surface is smooth and resin rich. The basin shall have a minimum wall thickness of 1/4 inch. An anti-floatation ring base shall be molded as an integral part of the basin assembly and shall be a minimum of 3" in diameter.

3.12 BASIN COVER

- A. The cover shall be of reinforced fiber filled to withstand 350 PSF live load rating. The cover shall be bolted to the basin with stainless steel cap screws. Stainless nuts shall be embedded in the fiberglass to prevent turning.

3.13 GUIDE RAIL / PIPING MODULE

- A. Guide rail shall be mounted in the basin on a stainless steel riser support which is to be securely mounted to the basin side wall. Guide rail shall be PVC corrosion resistant channel that when mounted to the PVC corrosion resistant discharge elbow will allow the pump, using the self cleaning ball check valve, to be lifted in and out of the station without any of the discharge piping being disturbed. Discharge piping shall be 1-1/4" schedule 80 PVC. Shut off valve shall be 1-1/4" PVC schedule 80 with shut off extension handle that is operational without personnel entering the wetwell.

3.14 CHECK VALVE

- A. Check valve shall be 1-1/4" schedule 80 PVC threaded on one end with a hydraulic flange on the other end. Check valve shall be self cleaning with a neoprene rubber ball and shall allow the pump to be removed from the station without making any disconnects.

3.15 JUNCTION BOX

- A. A U.L. nema 6 junction box shall be provided. The junction box shall be formed from corrosion resistant, flame retardant thermoplastic. Junction box shall have a hinged cover for ease of service. Float switches shall be suspended from a stainless steel holder securely mounted to the basin wall.

3.16 CONTROL PANEL

- A. Hydromatic model SPC control panel shall be supplied, compatible with package equipment specified herein.
- B. The motor control panel shall be assembled and tested by a shop meeting U.L. standard 508 for industrial controls. The motor and control panel shall be

SECTION 15110 - SUBMERSIBLE SEWAGE GRINDER PUMP STATION

assembled and tested by the same manufacturer supplying the pump so as to insure suitability and assurance of experience in matching controls to motors and to insure single source responsibility for the equipment

4.01 TESTING

- A. Commercial testing shall be required and include the following:
 - 1. The pump shall be visually inspected to confirm that it is built in accordance with the specification as to HP, voltage, phase and hertz.
 - 2. The stator motor leads shall be tested for integrity using a megohmmeter at the highest setting.
 - 3. Pump shall be allowed to run dry to check for proper rotation.
 - 4. Discharge piping shall be attached; the pump submerged in water and amp readings shall be taken in each leg to check for an imbalanced stator winding. If there is a significant difference in readings, the stator windings shall be checked with a bridge to determine if an unbalanced resistance exists. If so, the stator shall be replaced.
 - 5. The pump shall be removed from the water, megohmmeter tested again, dried and the motor housing filled with dielectric oil.
- B. In addition to the above commercial testing, a special megohmmeter test shall be performed and include the following:
 - 1. The pump shall be submerged in water and allowed to run at maximum load for 30 minutes.
 - 2. A written report on the above shall be prepared by the test engineer, certified and submitted to the engineer.
- C. (OPTIONAL) A hydrostatic test shall also be performed on the pump. The hydrostatic test shall require that the volute and impeller be removed and a fixture installed to hold the spring and lower mechanical seal in place. A double plate, gasket and through bolt shall be installed on the pump. A discharge mating flange, gasket and pressure fitting shall be installed. The inlet port, volute and discharge nozzle shall then be pressurized with water to 150% of the maximum pump shut off pressure. This hydrostatic pressure shall be maintained for at least 5 minutes and the housing checked for leaks and/or loss of pressure.

5.01 WARRANTY

- A. The pump unit or any part thereof shall be warranted against defects in material or workmanship within one year from date of installation or 18 months from date of manufacture, whichever comes first, and shall be replaced at no charge with a new or manufactured part, F.O.B. factory or authorized warranty service station. The warranty shall not assume responsibility for removal, reinstallation or freight, nor shall it assume responsibility of incidental damages resulting from the failure of the pump to perform. The warranty shall not apply to damage resulting from accident, alteration, design, misuse or abuse.

END OF SECTION

SECTION 15200 - DOMESTIC WATER SYSTEM - INDOORS

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Work under this Section includes all domestic cold and hot water systems inside the building to a point outside building as shown.
- B. Any and all charges by Utility Company shall be paid by this Contractor.

PART II - PRODUCTS

2.01 Water lines shall be:

- A. Type "K" soft drawn copper - underground.
- B. Type "L" hard drawn copper - above ground.

2.02 Water heater relief lines to be Type "L", hard drawn copper pipe and fittings, supported as water lines. Discharge to be full size of relief valve.

2.03 Reduced pressure backflow preventer: Wilkins 975XLS-AG full line size.

PART III - EXECUTION

3.01 Outdoor piping shall be at least 3'-0" below grade.

3.02 Test piping hydrostatically at 125 psi before applying insulation, for thirty minutes without drop in pressure. Notify authorities before test is to take place. Provide certificate of inspection.

3.03 Grade all piping towards main water service entrance to building and provide drain valves where grading of branches becomes impossible to drain to main water service, provide accessible, concealed hose thread drain valve.

3.04 Provide air chambers min. 12" – max 18" high and one pipe diameter larger than supply pipe in cold and hot water to fixture when not otherwise protected by shock absorbers.

3.05 Provide pressure reducing stations per detail on drawings.

3.06 No underground piping shall be covered prior to inspection by Engineer.

3.07 Piping joints shall be cleaned after soldering. Flux shall be low corrosion type. Joints which have solder or flux drippings on pipe will be remade or replaced at discretion of Engineer. No lead bearing solder permitted.

3.08 Where local utility company requires backflow preventer on water service, locate adjacent to PRV station, and provide vent drain of adequate size to hub drain or service sink.

3.09 STERILIZATION

- A. Flush system until water flows clear from all openings. Disinfect using a mixture of water and calcium hypochlorite in such proportions as to produce a chlorine dose of 50 PPM after 24 hours.
- B. Hold treated water in system for at least 24 hours during which time all valves, pumps, tanks and fixtures shall be operated at least five minutes or five times.
- C. Upon completion, flush entire system until chlorine content is less than 10 PPM.
- D. Do Not Proceed with sterilization of indoor water piping until quality of water in outdoor distribution system has been accepted.

SECTION 15200 - DOMESTIC WATER SYSTEM - INDOORS

END OF SECTION

SECTION 15300 - SOIL, WASTE, AND VENT SYSTEM - INDOORS

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Work under this section includes all soil, waste, and vent piping inside the building as shown on plans.

PART II - PRODUCTS

2.01 SOIL AND WASTE PIPING

- A. Above grade and within buildings: "No-Hub" cast iron pipe and fittings.
- B. Below grade within building: "No Hub" pipe and fittings.
- C. Below grade building exterior: Bell and spigot cast iron pipe and fittings.
- D. Contractor may use PVC-DWV Schedule 40, ASTM 2665 piping for all soil and waste if allowed by local code. EXCEPTION: Where piping penetrates rated wall, ceiling, floor, chase, etc., pipe must be cast iron at point of penetration. Piping located in an HVAC return air plenum must be cast iron.

2.02 VENT PIPING

- A. Above and Below grade: "No-Hub" cast iron pipe and fittings. Contractor may use pipe specified in 2.01-D. EXCEPTION: Where piping penetrates rated wall, ceiling, floor, chase, etc., pipe must be cast iron. Piping located in an HVAC return air plenum must be cast iron.

2.03 CLEANOUTS

- A. Cleanouts shall be as follows:

LOCATION	ZURN MODEL NUMBER
Finished floors	ZN-1400
Concealed risers	ZN-1469
Outdoors	ZN-1400
Horizontal pipe (above floor)	ZN-1400
- B. Acceptable Manufacturers: Zurn (or approved equal).

2.04 Floor drains shall be per schedule on drawings.

- A. Acceptable Manufacturers: Zurn or equal.

PART III - EXECUTION

3.01 Soil and waste shall be uniformly graded to elevations shown. If no elevations are given, they shall be pitched not less than 1/4" per foot for all pipes 2 1/2" in diameter and smaller and 1/8" per foot for pipes 3" and larger.

3.02 VENT PIPING

- A. Properly vent all fixtures as shown on the drawings. Project vents 12" above roof and install a flashing fitting approved by the roofing manufacturer.
- B. The heel of all vent stacks shall be flushed by the discharge of at least one fixture to prevent accumulation of rust and scale. Branch vent lines below the highest fixture will not be permitted.

SECTION 15300 - SOIL, WASTE, AND VENT SYSTEM - INDOORS

3.03 CLEANOUTS

- A. Cleanouts shall be provided at each change in direction of over 45 degrees, at the end of each soil or waste branch, at the base of each stack, and at least every 50 feet in all waste and soil lines or where indicated on drawings. Install wall cleanouts for horizontal vent lines below slab at point of rising in wall.
- B. Outdoors cleanouts shall terminate in a concrete block 18" X 18" by 6", flush with finish grade. Where concrete is in traffic area, reinforce concrete with #4 bars 6" on center each way.

3.04 Floor drains shall be of the same size as the pipe they are connected to.

3.05 Test all piping at no less than 10 feet of hydrostatic head for thirty minutes without lowering of the water level. Notify plumbing inspector and Engineer 48 hours in advance of when test is to take place.

3.06 No underground or concealed piping shall be covered prior to inspection by Engineer.

END OF SECTION

SECTION 15400 - PLUMBING FIXTURES AND TRIM

PART I - GENERAL

- 1.01** Furnish and install all plumbing fixtures with all trim, fittings, wall hangers, carriers and other devices for a complete installation. All fixtures and accessories shall be by the same manufacturer and all trim and fittings shall be by the fixture manufacturer, unless otherwise noted.

PART II - PRODUCTS

2.01 FIXTURES

- A. Plumbing fixtures as called for in "Plumbing Fixture Schedule".

PART III - EXECUTION

- 3.01** After plumbing fixtures are set in place, the cracks between the fixture and wall shall be caulked carefully with "Tube-Tite" or approved equal.
- 3.02** All exposed metal trim shall be chromium plated and polished.
- 3.03** Provide closets with white bolt caps and retainer clip.
- 3.04** Angle valves at fixtures shall have ½" IPS inlets, 3/8" O.D. risers, and chromium plated tubing.
- 3.05** Escutcheons shall have depth to conceal all pipe and fittings that are not chromium plated and its diameter shall cover wall openings. All escutcheons shall have set screw. Tolerance type fit, or split ring escutcheons will not be accepted.
- 3.06** All interior and exterior hose bibbs and hydrants to have ball valve installed at takeoff from main water supply.

END OF SECTION

SECTION 15742 - ELECTRIC HEATING EQUIPMENT

PART I - GENERAL

1.01 Provide heaters of sizes and capacities shown on drawings. All units to bear U.L. label.

PART II - PRODUCTS

2.01 WALL HEATERS

- A. Wall heaters shall be brand and model indicated on drawings, with tamper-proof, automatic controls. Heater shall be underwriters' Laboratories approved and furnished for mounting as shown on the drawings.

PART III - EXECUTION

3.01 Install equipment following manufacturer's instructions.

END OF SECTION

SECTION 15790 - EXHAUST FANS

PART I - GENERAL

1.01 Provide air handling equipment of types and capacities as shown on drawings.

PART II - DRAWINGS

2.01 IN-LINE EXHAUST FANS

- A. Provide in-line centrifugal exhaust fans or belt or direct drive as indicated on plans.
- B. Fan casing to be heavy gauge galvanized steel with access panels to allow motor and drive to be removed without removing fan casing.
- C. Bearings to be permanently lubricated pillow block type.
- D. Wheel to be backward inclined, statically and dynamically balanced.
- E. Fan to be approved for mounting arrangement as shown on plans.

PART III - EXECUTION - NOT USED

END OF SECTION

SECTION 15840 - DUCTWORK

PART I - GENERAL

- 1.01** Furnish and install galvanized sheet metal ducts where indicated and of sizes shown on drawings. All sheet metal work shall be manufactured and installed in accordance with the requirements of the National Fire Protection Association and the latest editions of the "Low Velocity and Duct Construction Standards" published by SMACNA.
- 1.02** Dimensions shown on ductwork are net. Increase duct size by total thickness of any internal insulation.
- 1.03** No ductwork shall be fabricated prior to verification of space conditions measurement.

PART II - PRODUCTS

- 2.01 DUCTWORK:** Galvanized Sheet Metal.
- 2.02 FLEXIBLE CONNECTIONS:** "Ventglass" double coated with neoprene.
- 2.03 GRILLES, REGISTERS, AND DIFFUSERS**
 - A. Each supply outlet shall have opposed blade, volume control damper.
 - B. Ceiling diffusers shall be provided with distribution grid.
- 2.04** Flexible duct shall be Geneflex Model SLR-181, with 1" of 3/4 pound density fiberglass insulation sheathed with an exterior vinyl vapor barrier jacket when shown on drawings.
- 2.05** Connections of flexible duct to main duct shall be by means of a spin-in fitting with 45 scoop and damper. Fittings shall be Geneflex model SM-IDEL.
- 2.06** Where exposed ductwork occurs, main and branch air readings to be taken thru "Ventlock" test plugs.
- 2.07** Access panels in ductwork to be per SMACNA plate #30, figure "C". Sliding access doors will not be allowed. This access door shall not be used in fire rated construction. See other sections.

PART III - EXECUTION

- 3.01** Square elbows shall be provided with air foil vanes. Single thickness will not be accepted.
- 3.02** Curved elbows with square throats are not acceptable.
- 3.03** Install hand-operated balancing dampers with locking quadrant as shown on drawings or as required, so that the systems can be properly balanced. Dampers shall be two gauges heavier than surrounding ductwork.
- 3.04** Mark permanent position of damper after balancing has been completed. Mark with curved arrow direction to open and indicate with a slash mark the fully closed position.
- 3.05** All duct connections to be in strict accordance with manufacturers instructions.
- 3.06** Provide flexible connections double coated with neoprene at all connections to air handling equipment.
- 3.07 TESTING OF AIR SYSTEM**
 - A. Provide three copies of all test data and results to Contracting Officer. Test data shall include actual fan RPM, CFM, running amperes, and voltage drawn by all motors.

END OF SECTION

SECTION 15900 - AUTOMATIC CONTROLS

PART I - GENERAL

- 1.01** Furnish and install a complete system of automatic controls to operate as indicated below.
- 1.02** This Contractor shall provide free of charge a one-year guarantee of the equipment. He shall provide 24-hour emergency service, and any service incidental to the proper performance of the control system.
- 1.03** Prior to the installation of the control system, this Contractor shall submit data showing in detail of the system that he proposes to install. Data shall include brochures on equipment and shop drawings, showing terminal to terminal electrical connections; shop drawings shall contain brief description of control operation.
- 1.04** All wiring, relays contactors, transformers, etc. for automatic controls shall be by this Contractor.

PART II - PRODUCTS

PART III - EXECUTION

- 3.01** Upon completion of installation, this Contractor shall regulate and adjust equipment provided by him.
- 3.02** Install all control, pilot circuit, and interlock wiring; including wiring through interposed safety or other auxiliary control devices required for proper operation of equipment.
- 3.03 SEQUENCE OF OPERATION**
 - A. Exhaust fans in toilet rooms shall be controlled by programmable timer.
 - B. Exhaust fan in vending room shall be controlled by light switch.
 - C. Wall heaters shall be controlled by built in thermostat.

END OF SECTION

**DUPONT SOCCER COMPLEX
CHATTANOOGA, TN**

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SECTION 16050 - BASIC MATERIALS & METHODS

PART I - GENERAL

1.01 DEFINITIONS:

Whenever occurring in Division 16000 the following words shall have the meanings given below:

- A. "Provide" shall mean to furnish, install and connect complete.
- B. "Wiring" shall mean wire or cable, installed in conduit, cable tray, or wireways with all required boxes, fittings, connectors, and accessories completely installed.
- C. "Work" shall be understood to mean the materials completely installed including the labor involved.
- D. "Plans and Specifications/Contract Documents" shall be understood to mean the complete documents, including all trades, divisions, sections, addenda, etc.
- E. "Review of Shop Drawings" - see Division 1.
- F. "Conduit" shall mean either rigid steel conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT), or plastic conduit (PVC).

1.02 The Contractor AGREES that upon the submittal of a bid, he will have read and studied ALL of the Contract Documents, and that all of the requirements and coordination resulting from these documents are included in his bid. The intent is to obtain a complete installation of electrical work to which end the Contractor shall provide ALL labor, equipment, material, freight, rigging, etc., specified, shown or scheduled on plans. He also agrees that any other accessory items which may not be specified, shown, or scheduled on the plans, but which normally are furnished or can be reasonably implied from the specifications and/or plans to be required shall be provided.

1.03 No exclusion from, or limitations in the drawings, specifications, or other contract documents for the electrical work shall be reason for the omitting of the appurtenances or accessories necessary to complete any required system or item of equipment in this project.

1.04 Should the Contractor find any discrepancies and/or omissions in the contract documents, or be in doubt as to the intent of said documents, he shall obtain clarification or correction from the Architect and the Engineer BEFORE submitting a bid for work under this division. The Contractor will not be granted monetary allowances for discrepancies between his bid and the intent or the work after the contract is let, due to failure to follow this instruction.

1.05 The contractor shall not use any material or equipment that contains asbestos, PCB's, or any other substance that is known to endanger the public health.

1.06 SCOPE OF WORK

- A. The Contractor shall refer to Architectural, Mechanical, and Structural drawings and Division 15 of these specifications for related work.
- B. The work of this division shall include the furnishing of all labor, supplies, materials, sales tax, permits, inspection fees, costs of testing, shop drawings, as built drawings, operation and maintenance manuals, and the performing of all operations including installation, cutting and chasing, trenching and backfilling, compaction, coordination with other trades on the job, etc., to the end of obtaining a complete installation of electrical work as shown on the drawings and called for in the written specifications.
- C. The work to be performed under the electrical contract shall include, but not be limited to:

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1. Service entrance conduit and wire.
 2. Service entrance equipment including disconnects, switchboards, panelboards, etc.
 3. Feeder conduit and wire.
 4. Distribution, lighting, and miscellaneous panelboards.
 5. Branch circuit conduit and wire.
 6. Lighting Fixtures.
 7. Wiring devices including receptacles, light switches, etc.
 8. Telephone service entrance conduit, and interior conduit and outlets.
 9. Fire Alarm System complete, if called for on the drawings
 10. Disconnects
 11. Control system conduit for mechanical contract.
 12. Provision of temporary power at 120/240, single phase for construction.
- D. Work not included under the electrical contract:
1. Unless provided in motor control center, all motor starters and their associated control devices, heaters, etc. will be furnished with the motors under Division 15 of these specifications.
 2. Control and interlock wiring for mechanical contract supplied systems.
 3. Telephone instruments and wiring
 4. Cable television equipment and wiring
- E. The owner will not make any consideration to the contractor for any alleged misunderstanding of the amount of work to be performed. Submittal of a bid for work shall convey full agreement by the Contractor to all items and conditions specified, indicated on the drawings, and/or required by the nature of the job site.
- F. The Contractor shall be responsible for insuring that all equipment and materials are installed in a neat and workmanlike manner and are aligned, leveled and adjusted for satisfactory operation. He shall install all equipment so that all parts are easily accessible for inspection, operation, maintenance and repair. He shall insure that all equipment is solidly supported from building structures.

1.07 CODES, LAWS AND ORDINANCES

- A. Comply with all laws, codes, ordinances, and etc., having jurisdiction over the work to be performed under the contract for this project, EXCEPT where the requirements of the drawings and/or specifications are in excess of those called for in said laws, codes, ordinances, etc.
- B. Perform work in accordance with the standards listed below; EXCEPT where federal, state and/or local codes are more stringent, in which case, follow them instead:
1. National Fire Protection Association NFPA
 2. Underwriters Laboratories UL
 3. American Society of Testing Materials ASTM

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- | | | |
|----|---|------|
| 4. | National Electrical Code | NEC |
| 5. | National Electrical Manufacturing Association | NEMA |
| 6. | Occupational Safety & Health Act | OSHA |
- C. The Contractor shall be responsible for installation of the work called for in the contract documents in accordance with all codes, laws, and ordinances, which govern such work. Should he encounter anything contained within the contract documents during preparation for bid which would prohibit the successful compliance of his responsibility under this item, he shall notify the Architect prior to execution of the contract for work so that adjustments can be made to the contract.
- D. The Contractor shall be responsible for obtaining all permits, inspection certificates, etc., required by local, state and/or federal authorities for this project, at his expense. Any and all additional work, expense, etc., incurred as the result of failure to request timely inspections, and or permits, shall be charged against the Contractor.
- E. Approval of the Architect, Engineer, and the appropriate inspection authorities must be secured for the complete electrical installation prior to contract closeout. Upon completion of the electrical work, the Contractor will furnish the Architect with two (2) copies of all certificates of inspection, permits, etc. Final payment to the Contractor will not be made until the requirements of this paragraph have been met.

1.08 LOCAL CONDITIONS

- A. Existing site utilities, underground services, structures, etc., are shown on the drawings accurately in scope only. No expressed or implied guarantee is given as to exact location of the above items. The Contractor is required to verify exact locations and subsequent effects of such on the job.
- B. The Contractor shall contact the local utility companies (power, telephone, etc.) to confirm the scheme of service called for on the drawings. Should the Contractor discover the need for any change to these service schemes per the utility involved, he shall notify the Architect prior to execution of the contract so that a solution can be provided. If any cost will be incurred to the project for any of the utilities to provide their services, the Contractor shall include this cost in the bid. If the utility does not furnish this cost number to the Contractor prior to bid submittal, the Contractor shall include a letter with the bid submittal stating this fact. This letter shall state that the cost will be forthcoming and will be an addition to the contract.
- C. Contractor shall verify with the Local Power Company the value of fault current in amperes which will be available at the secondary terminals of the Power Company transformer. If this value is in excess of the AIC ratings of the various panels, circuit breakers, etc., as shown on the drawings, the Contractor shall supply such equipment with AIC ratings which will accommodate the available fault current. Any increase in cost due to this item shall be included in the bid.
- D. Contractors desiring to bid on work under this division are required to visit the job site before bid submittal. During said visit the Contractor shall become familiar with all site conditions which will affect his work and the cost of the work. He shall also verify exact location of the equipment of the various utility companies from whom services will be required. The Contractor shall submit a letter with his bid stating that he has complied with this requirement.

1.09 PLANS AND SPECIFICATIONS

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- A. While drawings are to scale, they are diagrammatic. **DO NOT SCALE DRAWINGS HAVING 1/4" OR SMALLER SCALE.** Equipment, conduit, outlets, etc., are not exactly positioned; therefore, the Contractor shall refer to architectural drawings for actual building dimensions, ceiling layouts, light fixture locations, work by other trades, etc.
- B. Should any conflict exist between the drawings and the written specifications, the specifications shall generally govern. Contact Engineer for clarifications.
- C. The drawings and written specifications for all divisions are part of the contract. Any work and material shown in the one and omitted in the other, or which may be reasonably implied by both or either, shall be fully furnished and performed by the Contractor, as required for a complete electrical system installation.
- D. No deviation from the drawings and specifications shall be made without the full knowledge and consent of the Architect. Should the Contractor find, at any time during the progress of the work, that, in his judgment, existing conditions make desirable a modification in requirements covering any particular item or items, he shall report such item promptly to the Architect for his decision and instructions.
- E. The right is reserved by the Architect to move any equipment, outlet, conduit, etc.; as much as ten (10) feet at no increase in cost, provided the Contractor is notified of the change before work on the detail in question is started.
- F. It shall be the responsibility of the Contractor to insure that the equipment he provides will fit into the available space, leaving reasonable space for maintenance and servicing of the equipment. If, after the installation of any equipment, it is determined that the space requirements have not been met, the Contractor shall rearrange the work at no additional cost.

1.10 COORDINATION OF WORK

- A. It is the responsibility of the Contractor to plan all work so that it proceeds with a minimum of interference with all other trades. He is to inform all parties concerned of openings in the building construction for equipment or conduit required for the electrical work. He is to coordinate the electrical work with the mechanical and plumbing installation.
- B. The contractor shall review and coordinate the locations of all electrical equipment (meters, instrument transformer cabinets, panels, disconnect switches, lighting contactors, etc.) mounted on the outside walls of buildings with the drawings for the mechanical, plumbing, and architectural disciplines to avoid any conflicts in locations with sprinkler risers, plumbing risers, rain downspouts, doors, etc. Generally meter center risers are shown on the drawings for the purposes of information only; they are not dimensioned. In addition, the locations of the meter centers on the site plans are diagrammatic only. They are not dimensioned. The contractor must coordinate these installations. If there are any questions as to locations of equipment, notify the engineer for clarification prior to installation of equipment.
- C. The Contractor shall provide all required frames, sleeves, inserts, supports, anchor bolts, etc., as required for completion of the work.
- D. The Contractor shall lay out and coordinate all work well enough in advance so as to avoid conflicts or interference with other work in progress. If there is any interference, the electrical layout may be altered to suit the conditions, prior to the installation of any work and at no additional cost to the Owner. Consult the Architect for instructions.
- E. The contractor shall verify the location of all disconnect switches required by the

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project, prior to their installation. The installed location of any disconnect shall not impede the access to, or working space around, any piece of equipment. Neither shall the location cause any loss of equipment performance due to impeded air flow, etc. This requirement applies regardless of the location shown for the disconnects on the plans. If there is any question as to disconnect location, the contractor shall ask the engineer for clarification prior to installation. If any disconnect is found to be installed in such a way that it causes any problems as mentioned above, it shall be relocated at the expense of the contractor.

- F. Work lines and established heights shall be in strict accordance with architectural drawings and specifications, insofar as these drawings and specifications extend. It is the Contractor's responsibility to verify all elevations and detailed dimensions not indicated.
- G. The Contractor shall coordinate all outlets, fixtures, equipment, etc., with floor, wall and ceiling patterns. Any lines which must pitch shall have right-of-way over lines whose elevations can be changed.

1.11 EQUIPMENT DATA:

- A. Deliver all printed tags, instructions, certified drawings, parts lists, certificates, etc., supplied with equipment items, to the Architect at completion of the project.
- B. Assemble all such printed materials into a stiff-back binder identified on its face. Provide quadruple copies.

1.12 SHOP DRAWINGS

- A. Shop drawings for switchboards, panelboards, transformers, generators, bus duct, cable tray, fire alarm systems, security systems, lighting fixtures, and other items as might be requested, shall be submitted to the Architect's Engineer for his approval, by the Contractor promptly upon receipt of the contract for work.
- B. The engineer will review the shop drawings for errors in the contractor's interpretation of the contract documents only, and to assist the contractor in compliance with the documents. Corrections of comments made on shop drawings during the review do not relieve the contractor from compliance with requirements of the contract documents, plans, and specifications. Review of the shop drawings shall not relieve the contractor from responsibility for confirming and correlating all quantities and dimensions, coordination of his work with the other trades, and performance of his work in a safe and satisfactory manner. Review of shop drawings shall not permit any deviations from plans and specifications by the contractor, nor shall it permit changes to the plans and specifications by the engineer. Changes to, or deviations from, the contract documents may only be made by a Change Order issued by the Architect and executed properly.
- C. The contractor shall review the information prepared by his suppliers and note any changes required prior to submitting the information to the engineer and shall include the form, Exhibit 2, entitled "Certification of Compliance – Shop Drawings" with each submittal (see end of specifications). Failure to complete and submit this form will result in rejection of the submittal without review.
- D. Equipment subject to shop drawing approval shall not be ordered until approved by the Engineer. Material ordered or installed without such approval, if rejected by the Engineer, shall be removed and replaced with approved items at the Contractor's expense.

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- E. In order to procure approval for such equipment, the Contractor shall submit a minimum of six (6) sets of shop drawings and/or brochures describing each piece of equipment. Description shall include rated capacities, dimensions, manufacturer's catalog number, performance data with operating characteristics, optional features, modifications, etc.
- F. ALL BROCHURES AND DRAWINGS SHALL BE SUBMITTED AT THE SAME TIME. Items not approved shall be resubmitted with the necessary corrections made until final approval is obtained.
- G. See individual specification sections for additional shop drawing requirements.
- H. If equipment is substituted and approved in the shop drawing process; its use may affect electrical, mechanical, structural, and other systems which were designed based on the original equipment specifications. Any changes, and their cost, in any of the divisions of work affected by the substitution of equipment, shall be the sole responsibility of the contractor making the substitution.

PART II - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new and the best grade. They shall conform to all standards and requirements governing the work. Any and all equipment and materials damaged during installation shall be immediately replaced at NO cost to the Owner.
- B. Reference shall be made to drawing schedules and details and/or specifications for manufacturer, model, catalog number, size, capacity, performance, installation, etc., of equipment and material. Such information is used to denote design, workmanship, and quality desired.
- C. The Contractor shall offer his bid for work based on the electrical equipment (including light fixtures) which is described in these specifications and described in the respective schedules on the drawings. Pre-bid approvals for substitute equipment will not be given.
- D. PRODUCT SELECTION PROCEDURES: Product selection shall be governed by the Contract Documents, and not by previous project experience which the Contractor or his suppliers may possess. Procedures governing product selection include the following:
 - 1. PROPRIETARY SPECIFICATION REQUIREMENTS: Where only a single product or manufacturer is named, provide the product indicated. No substitutions shall be permitted.
 - 2. SEMIPROPRIETARY SPECIFICATION REQUIREMENTS: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions shall be permitted.
 - 3. NON-PROPRIETARY SPECIFICATONS: When the specification lists products or manufacturers that are available for incorporation into the work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product which complies with the contract requirements. Such products are still subject to the shop drawings submittal process.
- E. In the submission of substitute equipment and materials, the Contractor shall note the following: (1) capacities are absolute minimum and must be equaled, (2) physical size

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limitations for space allotted, (3) structural properties, (4) noise levels, (5) interchangeability, (6) compatibility with other materials, (7) similar items shall be same manufacturer and style wherever possible.

- F. All materials and equipment, for which a UL or NEMA standard is established, shall be so approved and labeled or stamped.
- G. NEMA standards shall be taken as minimum requirements for electrical equipment.
- H. Electrical equipment shall operate properly under a 10 percent plus or minus voltage variation.
- I. Adhesives are not acceptable as mounting, supporting or assembling media.

PART III - EXECUTION

3.01 All materials required for the project shall be ordered by the Contractor in a timely manner which allows the material to be received at the job site for installation in agreement with the job schedule, so that work of the other divisions is not held up in any way.

3.02 All materials and equipment received at the job site by the Contractor shall be stored and protected from damage while they wait to be installed.

3.03 All work shall be carried out in a neat and orderly manner by experienced electricians, under the constant supervision of a competent electrician, trained and licensed in this field, who shall represent the Contractor at all times in connection with the work.

3.04 Materials or work installed, rejected by the Architect's Engineer upon inspection shall be completely removed by the Contractor, and the work redone in a manner acceptable to the Engineer by the Contractor at no charge.

3.05 When rejected work is removed, should other material, equipment, etc., be damaged in the process, the Contractor shall make all necessary repairs, so that the damaged equipment is equal in quality, strength and appearance to its original state.

3.06 SPACE REQUIREMENTS:

- A. The Contractor is fully responsible for determining in advance of purchase that all equipment and materials proposed for installation will fit into the space indicated while allowing sufficient clearance about the equipment and materials to allow proper maintenance and servicing of all components requiring such, including equipment and materials of other divisions located in the vicinity.
- B. Clearances in front of panelboards, switchboards, motor starters, busway taps, and other electrical equipment requiring servicing while energized, shall be provided in accordance with the NEC, table 110-16a, as required by the code text.
- C. The contractor shall prepare, and submit for review and approval prior to ordering equipment, dimensioned rough-in drawings at $\frac{1}{2}" = 1'-0"$ scale for each equipment room and meter equipment layout. These drawings shall show all equipment to scale based on the actual equipment ordered and shall be fully dimensioned.

3.07 FIRESTOPPING:

- A. Firestop all penetrations of building fire rated surfaces made by this division.
- B. Each penetration shall be protected by a firestop system with a rating equal to or greater than the original assembly in which the penetration occurs.
- C. All firestop material shall be installed in accordance with manufacturer's standard

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details and the UL Building Materials Directory for each type of fire rated assembly penetrated.

- D. Telephone sleeves shall be firestopped with materials that will permit re-entry and use of the sleeves.

3.08 WIRING ELECTRICALLY OPERATED EQUIPMENT:

- A. The Contractor shall provide all conduit, conductors, wiring, etc., required to connect power to all electrically operated equipment installed on the project, whether provided by this division or other divisions, or by the owner.
- B. The Contractor shall install, support, and electrically connect motor starters, disconnects, etc., and shall complete all power wiring circuits so that each is left in satisfactory condition.
- C. All control equipment associated with any equipment furnished under any other division, or by the owner, shall be furnished by that provider.
- D. This division shall provide all conduit required for control wiring as needed for Division 15000. Refer to that division and its associated drawings for specifics.
- E. This division is responsible for the provision of, and fire alarm system wiring of, duct smoke detectors for all HVAC equipment requiring them. If there is a fire alarm system provided for the project, the detectors shall be tied to that system. If there is no fire alarm system, the Contractor shall provide remote visual and audible alarm indicators per the requirements of NFPA 90A, latest edition.

3.09 RECORD AND AS-BUILT DOCUMENTS:

- A. The Contractor shall maintain at the job site a complete set of Contract Documents. These documents shall be kept current with all changes, substitutions, etc., to the original documents as reflected by the actual work being installed.
- B. At closeout, the Contractor shall provide the Owner with one complete set of as-built reproducible drawings, and two clean sets of complete specifications. These documents shall show installed locations, sizes, etc., of all work and material as required by the contract documents and actually installed on the project.
- C. For each piece of equipment installed or provided, the Contractor shall provide three (3) sets of:
 - 1. Manufacturer's printed catalog pages
 - 2. Manufacturer's operating and maintenance instructions
 - 3. Manufacturer's wiring and connection diagrams, etc.,
 - 4. Motor interlock and control diagrams, showing operating instructions for, and normal positions of, each motor and controller

All of this information shall be provided in bound 8-1/2" by 11" hardback booklets.

3.10 CLEANING:

- A. The Contractor shall insure that all interior and exterior surfaces of panelboards, transformers, switchboards, motor starters, cabinets, etc., are cleaned so as to be free of dust, dirt, grease, plaster, debris, etc. Lighting fixtures shall be cleaned according to manufacturer's recommendations.
- B. Any electrical equipment having sustained damage to any factory painted surfaces

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shall have that damage repaired and restored to original factory condition.

- C. Any and all ferrous metal surfaces exposed on the electrical system shall be painted.

3.11 TEMPORARY LIGHTING AND POWER:

- A. As soon as is possible, the Contractor shall install temporary electrical wiring and lighting for the project in accordance with NEC Article 305.
- B. Wiring shall consist of non-metallic sheathed cable with ground wire.

3.12 EXCAVATION, SHORING, AND BACKFILL:

- A. The Contractor shall perform all necessary excavation required for installation of his work. Each utility shall be installed in a separate trench.
- B. Excavation shall be below that required for general construction and final grade. It is expected that the Contractor shall process normally difficulties encountered in excavation related to rocks, debris, etc. However, should the Contractor encounter "solid" rock impediments to his excavation, he shall contact the Architect for directions.
- C. Any and all trenching shall be performed strictly in accordance with OSHA, and other authorities having jurisdiction, rules and regulations regarding "cave in" safety shoring. All shoring material used shall be completely removed prior to backfilling the trench.
- D. The Contractor shall not backfill trenches until the conduit banks have been inspected by the proper authorities.
- E. Backfill shall be done simultaneously on both sides of the equipment, raceways, etc. Backfill shall be clean soil, free of rocks, cinders, wood, debris, etc.
- F. Backfill shall be installed in 12-inch layers. It shall be compacted to 85% per ASTM D-1557 in areas under sidewalks and grass; and to 95% under any paved areas.
- G. Should concrete encasement of raceways be required, the sides and floor of the trench shall be used as formwork for the concrete. This shall not apply unless the excavation is clean, free of debris, and of the proper size.

3.13 CUTTING AND PATCHING:

- A. The Contractor shall be responsible for the location and size of all openings required for his work.
- B. The Contractor shall not cut into structural members or architectural finish surfaces without expressed written approval of the Architect.
- C. Any patching of surfaces required by the Contractor's work shall be made so that they are equal in quality and appearance to the original surface.

3.14 FLASHING:

- A. Raceways which pass through walls or roof surfaces to the outside shall be flashed in accordance with architectural standards and with the requirements of the roofing manufacturer.
- B. Any raceways penetrating the roof shall maintain a clearance of 18 inches minimum from all parapets.
- C. Whenever raceways pass through floor structures which contain a water proofing membrane, the Contractor shall provide a watertight floor sleeve for each raceway. The lowest floor shall be exempt.

SECTION 16050 - BASIC MATERIALS & METHODS

3.15 MOISTURE - DAMP PROTECTION:

- A. Whenever any electrical component such as panels, raceways, etc., will be in contact with surfaces which may become damp or wet, that component shall be mounted on standoff devices so that it is a minimum of ¼" away from the surface.

3.16 GUARANTEE AND WARRANTY:

- A. The Contractor and the General Contractor shall, and hereby does, guarantee that all work executed, and all electrical equipment installed, under this division will be free of all defects in materials, manufacture, and workmanship for a period of one (1) year from the date of final acceptance of the building. The above parties agree that they will, at their expense, repair and/or replace all such defective work and equipment, and any and all other work damaged thereby, which becomes defective during the term of this guarantee.

END OF SECTION

SECTION 16060 - GROUNDING

PART I - GENERAL

- 1.01** The Contractor shall insure that all parts of any and all electrical installations which either enclose or guard live parts shall be solidly grounded
- 1.02** All work performed under this Division shall meet the grounding requirements of the NEC, Article 250.

PART II - PRODUCTS

2.01 CONDUCTORS:

- A. All grounding conductors shall be copper. Conductors smaller than No. 8 AWG shall be solid; all other conductors shall be stranded. Ground conductors shall be bare or have type THHN insulation, green in color.
- B. Aluminum grounding conductors are strictly prohibited.
- C. Service entrance grounding electrode conductors shall be sized per the NEC, Article 250, and table # 250-94.
- D. Equipment grounding conductors shall be sized per the NEC, Article 250, and table # 250-95.

2.02 GROUND RODS:

- A. Ground rods shall be copper clad, sectional, solid steel. Rods shall be 10-ft. long, $\frac{3}{4}$ in. diameter. Rods shall be sectional, threaded on both ends to be used if depths of more than 10 feet are required to achieve desired ground resistance value of 5 ohms. All couplings shall be bronze made by the rod manufacturer. Rods shall be as manufactured by the Copperweld Steel Company.

2.03 CONNECTIONS:

- A. Grounding connections made to ground rods, building re-steel, or counterpoise systems shall be made with the Cadweld process.
- B. Grounding connections to water pipes shall be made with clamps intended for the purpose such as Burndy type GAR clamps.
- C. Grounding connections to boxes, fixtures, etc. shall be made at the factory provided grounding lug.

PART III - EXECUTION

- 3.01** The Contractor shall provide grounds to all equipment requiring them, including, but not limited to:
- A. Electric service
 - B. Secondary of transformers (except the isolating type).
 - C. Conduit and enclosures.
 - D. All neutral conductors.
 - E. Panelboards, switchboards, etc.
 - F. Ground terminals on receptacles, appliances, equipment, etc.
- 3.02** In all conduit systems the Contractor shall provide a separate green grounding conductor, in addition to the circuit neutral, inside the raceway with the phase conductors.

SECTION 16060 - GROUNDING

- 3.03** The Contractor shall, unless otherwise noted, use the cold water piping system along with two 3/4" copperweld ground rods, driven to a depth to provide a maximum of 5 ohms ground resistance, as the grounding electrodes for the electrical system. The grounding conductor that connects the electrical system to the ground electrode shall be sized per the NEC table 250-94. The ground rods and the grounding conductor shall be attached to the same physical point on the water pipe. Two bolt style, split, wrap around ground clamps shall be used to clamp conductor to water pipe. The Contractor shall connect the copper grounding conductor to the main panel device, i.e., panelboard, switchboard, etc.; and shall connect it to the system neutral at this point. Shunt connections across valves and water meter shall be provided.
- 3.04** When the water system is nonmetallic pipe, then the ground system shall consist of a minimum of three (3) ground rods spaced 10'-0" apart minimum. Tops of rods to be placed a minimum of 12" below the surface of the ground.
- 3.05** When equipment is subjected to vibration, when flexible conduit is used, and when surface raceways are used, the Contractor shall connect the equipment ground terminal to the rigid conduit system by means of a ground wire.
- 3.06** The neutral of all dry type transformers shall be grounded to building steel or cold water pipe. All such connections shall be made in a physical building space where damage to the connection is not likely.

END OF SECTION

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART I - GENERAL

- 1.01** The Contractor shall insure that all electrical equipment is properly and visually marked as to function, voltage, etc.
- 1.02** All General and Supplementary Conditions and General Requirements (Division 1) shall apply to the work specified in this section.

PART II - PRODUCTS

2.01 MATERIALS:

- A. Conduit and raceway labeling shall be with stenciled letters of height of 2 conduit diameters, or 2 inches, which ever is smaller. Voltage and function shall be stated in label.
- B. Label paint shall be:
1. 480/277 volt raceway – Red paint
 2. 208/120 volt raceway – Black paint
 3. 240/120 volt raceway – Blue paint
- C. Equipment and cabinet labeling shall be done with plastic plates of sandwich type materials with the inner material being white in color. All such plates are to be attached to the cabinets or equipment with screws. Plates shall state equipment or cabinet name, voltage, phase, and date installed. Plate outer plastic colors shall be:
1. 480/120 volt equipment – Red plastic with white letters
 2. 208/120 volt equipment – Black plastic with white letters
 3. 240/120 volt equipment – Blue plastic with white letters
- All lettering is to be made by machine engraving which cuts through the outer colored plastic plate to reveal white color letters with letter height of 3/8".
- D. Panelboards and switchboards shall be provided with circuit directories of white heavy paper cards. Schedules shall be type written in black ink.

PART III - EXECUTION

- 3.01** The Contractor shall provide labels for all electrical panels, switchboards, disconnects, cabinets, feeder and service raceways, motors, and major pieces of electrical equipment installed under this division.
- 3.02** Each panelboard shall be provided with a typewritten directory card of all circuits in the panel.
- 3.03** Each circuit breaker in all switchboards shall be labeled as to what it feeds. All breakers shall have their ampacity clearly marked on the breaker.
- 3.04** Underground outside conduit runs shall be marked. Markers shall consist of 4" by 4" by 18" long concrete stakes located above the conduit at ends and corners. Install stakes flush with finished grade.
- 3.05** All feeder raceways shall be labeled by stenciling at intervals not to exceed 50 feet along the entire length of the raceways where they are exposed.

END OF SECTION

Requirements for Insurance Coverage

The Contractor shall not commence work under these Contract Documents until he has obtained all insurance required herein nor shall the Contractor allow any Subcontractor to commence work on his subcontract until similar insurance required of the Subcontractor has been obtained by the Subcontractor. Insurance shall be placed by the Contractor with one or more insurance carriers licensed to do business in the State of Tennessee. Each insurance policy shall be renewed ten (10) days before the expiration date of the policy.

Certificates of insurance shall be filed with the City prior to commencement of the work. These certificates shall contain a provision that coverages afforded under the policies will not be changed or canceled unless at least fifteen (15) days' written notice has been given to the City. The Contract shall not be binding upon the City until the insurance coverage required herein has been obtained and certificates have been filed with the City.

Adequate insurance coverage shall be maintained by the Contractor at all times. Failure to maintain adequate coverage shall not relieve the Contractor of any responsibilities or obligations under these Contract Documents. In the event any insurance coverage is canceled or allowed to lapse, the Contractor will not be permitted to prosecute the work until adequate and satisfactory insurance has been obtained and certificates of insurance furnished to the City. Failure to keep insurance policies in effect will not be cause for any claims for extension of time under these Contract Documents.

All such policies shall be subject to approval by the City Attorney. Should the City Attorney at any time in his sole discretion determine that the insurance policies and certificate provided may not be sufficient to protect the interests of the City because of the insolvency of the insurance company or otherwise, the Contractor shall replace such policies with policies meeting his approval.

The Contractor shall procure and maintain at his own expense, during the Contract Time, insurance as hereinafter specified:

Workmen's Compensation Insurance that shall protect the Contractor against all claims under applicable state workmen's compensation laws shall be maintained. The Contractor shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workmen's compensation law. This policy shall also include an endorsement providing coverage in all states in which work is performed. The Contractor shall require all the Subcontractors to provide similar Workmen's Compensation Insurance for all the Subcontractors' employees on the work unless such employees are covered by the protection afforded by the Contractor. The liability limits shall not be less than that required by the statute.

General Public Liability and Property Damage Insurance that shall be written in comprehensive form and shall protect the Contractor against all claims arising from injuries including death, to members of the Public or damage to property of others arising

out of any act or omission of the Contractor or his agents, employees, or Subcontractors. In addition, this policy shall specifically insure the contractual liability assumed by the successful bidder to defend and indemnify the City of Chattanooga against such claims or suits.

To the extent that the work may require blasting, explosive conditions or underground operation, the comprehensive general public liability and property damage coverage shall contain no exclusion relative to blasting, explosion, collapse of buildings, or damage to underground property.

The comprehensive general public liability and property damage coverage shall also protect the Contractor against all claims resulting from damage to:

1. Private driveways, walks, shrubbery, and plantings
2. Public utility facilities
3. United States Government monuments

The liability limits shall not be less than:

Bodily Injury	\$ 500,000 each person \$1,000,000 each occurrence
Property Damage	\$ 250,000 each occurrence \$ 500,000 aggregate

The general public liability and property damage insurance shall carry an endorsement in form satisfactory to the City to the effect that the Contractor shall save harmless the City from any claims and damage whatsoever, including patent infringement. General public liability and property damage insurance shall be kept in force at all times during the course of the work until such time as the work covered by these Contract Documents has been completed and accepted by the City.

Comprehensive Motor Vehicle Liability and Property Damage Insurance that shall be written in comprehensive form and shall protect the Contractor against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operation on or off the site of all motor vehicles licensed for highway use, whether they are owned, non-owned, or hired.

The liability limits shall not be less than:

Bodily Injury	\$ 250,000 each person \$ 500,000 each occurrence
Property Damage	\$ 100,000 each occurrence

The Contractor (not the Owner) shall purchase and maintain until Substantial Completion Builder's Risk Insurance (not All Risk Insurance) in the amount of the initial Contract Sum plus any amounts added by Change Order. The insurance shall list and include as named insured the City of Chattanooga, the Contractor, and all Subcontractors A.T.I.M.A. The deductible amount shall be \$1,000.00 for each occurrence, which shall be paid by the Contractor. The Builder's Risk Insurance shall also provide coverage for portions of the work in transit and for temporary storage of portions of the work to the value approved by the City in the Certificate for Payment.