

Company Name - _____

REQUEST FOR RESPONSE

RFR #

GOODWIN PARK IRRIGATION & BOOSTER PUMP PROJECT
DPW



City of Hartford
Procurement Services Unit
550 Main Street
Hartford, CT 06103

Susan Sheppard
Project Manager
860-757-9616
smsheppard@hartford.gov



INVITATION TO RESPOND

Dear Sir/Madam:

The City of Hartford (the City) invites responses for:

| | |
|---|---|
| RFR #: | SOLICITATION DATE: |
| SOLICITATION TITLE: GOODWIN PARK IRRIGATION AND BOOSTER PUMP PROJECT | |
| SOLICITATION DESCRIPTION: CONSTRUCTION OF BOOSTER PUMP ASSEMBLY, PRE-FABRICATED STRUCTURE, WELL REPLACEMENT AND CONTROLS AND INSTALLATION OF NEW IRRIGATION SYSTEM AT GOODWIN PARK GOLF COURSE (27 HOLES) | |
| SITE LOCATION (if applicable): GOODWIN PARK, HARTFORD, CT | |
| RESPONSE DATE : | RESPONSE TIME: 2:00 p.m. |
| DEPT. ASSIGNED CONTRACT #: DPW16-04 | EST. COST OF CONSTRUCTION: \$ 3,500,000 |

A PRE-BID / RESPONSE CONFERENCE HAS BEEN SCHEDULED FOR _____ AT _____
 (Date / Time) (Location)

This pre-bid conference is: Not Applicable
 Mandatory (All prospective bidders are REQUIRED to attend to discuss specifications)
 Non-mandatory (All prospective bidders are encouraged to attend to discuss specifications)

This solicitation contains the following sections:

Invitation to Respond

Standard Instructions

Project Site Location – (for construction projects only)

Table of Contents – (for construction projects only)

Section 1 – Response Forms

1.1 Response Information & Signature Form

Contract Compliance

- Affirmative Action / Equal Employment Opportunity Requirements – See Section 3.6
- Surety Bond Requirements Bid Bond Performance & Payment Bonds
- Insurance Requirements – see exhibits below
- Set Aside – Ord. Section 2-660 MWBE Small Contractor
- City-Based Small Business Bid Preference – Ord. Section 2-661
- 15% Minority Utilization (City of Hartford Certified MWBE) – Ord. Section 2-682
- State of Connecticut DAS Prequalification (Public Construction Project > \$500,000)
- OSHA Compliance (Public Works Project > \$100,000)
- Wage Requirements – Complete & attach Wage Certification Form

1.2 Response Pricing

1.3 Statement of Qualifications

1.4 Subcontractor Information

Section 2 – Specifications/Scope of Services

Special Instructions / Conditions included

Section 3 – General Information for Preparation and Delivery of a Response

Section 4 – Terms and Conditions / Labor Compliance

Insurance Requirements

Exhibits

Plans & Drawings included

Sincerely,

Susan Shepard

Procurement Specialist

For more information or to respond, please visit www.hartford.gov/procurement/purchasing

STANDARD INSTRUCTIONS:

- Questions & Addenda

Questions related to this project must be submitted via email to the buyer referenced on the Invitation to respond within seventy-two (72) hours in advance of the response submittal deadline. Responses to such questions will be posted electronically on the Planet Bids website within twenty-four (24) hours of the response submittal deadline. Respondents are responsible for obtaining all addenda related to this RFR and thus advised to check for any addenda a minimum of twenty-four (24) hours in advance of the response deadline.

- Taxpayer's Identification Number

- Respondents must provide their Taxpayer Identification number on the response form (Tax ID#). Award recipients, whether an individual, proprietor, partnership or a non-profit corporation or organization must file the Internal Revenue Service Form W-9, Request for Taxpayer Identification Number and Certification with the City.

- Responsible Candidate

- Respondent must not have any delinquent taxes or financial obligations due
- Respondent must execute an affidavit to comply with all federal and state requirements
- Respondent must be certified as an Equal Opportunity Employer

- Calendar days allowed for contract work / Substantial completion date:

- Liquidated damages for late completion:

- Bid Bond / Performance & Payment bonds (required if checked on invitation to respond)

- 10% bid bond, cashiers or certified check with your response. The City of Hartford provides contractors with the option of submitting an electronic Bid Bond through the Surety2000 website. Surety 2000 is an Internet-based surety processing, verification and security system, developed in cooperation with the surety industry. You may contact Surety 2000 at 1-800-660-3263 or www.surety2000.com, for more information.
- Performance and payment bonds for 100% of the project upon award if the contract value exceeds \$50,000.00.

- DAS prequalification program (construction / infrastructure projects only)

- The DAS Contractor Prequalification Program, Connecticut General Statutes Section 4a-100, requires all contractors to prequalify "before they can bid on any construction, alteration, remodeling, repair or demolition of any public building (does not apply to road construction), for work by the state or a municipality, estimated to cost more than \$500,000 and which is funded in whole or in part with state funds. "

- Drawings (construction / infrastructure projects only)

- Drawings, Bid Forms and Specifications are available electronically and located at www.hartford.gov/procurement/purchasing (Click on current solicitations and bid opportunities) and select this project. Fees, if any to purchase sets are non-refundable.

- In addition to your hand delivered response, submit # hard-copies to:

- Hartford City Hall, Procurement Services, 550 Main Street, Room 100, Hartford, CT 06103

Updated 8/10/12

CITY OF HARTFORD
WAGE CERTIFICATION FORM

I, _____ of _____
Officer, Owner, Authorized Rep. Company Name

do hereby certify that the _____
Company Name

Street

City

and all of its subcontractors will pay all workers on the

Project Name and Number

Street and City

the following wages as required for such project (a copy of the rates which is attached hereto):

State of Connecticut Prevailing wage rates

Federal Prevailing wage rates

City of Hartford Living wage rates

Signature

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

Notary Public

CONSTRUCTION PROJECT SUMMARY SHEET

| | |
|------------------------|---|
| RFR NUMBER: | |
| CONTRACT NUMBER | DPW |
| BID TITLE: | GOODWIN PARK IRRIGATION AND BOOSTER PUMP IMPROVEMENTS |

ESTIMATED CONSTRUCTION COST: \$ 3,500,000 Base Bid and Alternates

CONTRACT TYPE: OPEN COMPETITIVE WITH DBE % GOAL

SMALL MINORITY BUSINESS ENTERPRISE SET ASIDE

SMALL CONTRACTOR SET ASIDE

STATE OF CONNECTICUT PREQUALIFICATION REQUIRED: YES NO

PERCENTAGE OF DBE GOAL: 15%

FEDERAL WAGE RATE REQUIREMENTS: YES NO

STATE WAGE RATE REQUIREMENTS: YES NO

HARTFORD BASED BIDDER ADVANTAGE: APPLICABLE NON-APPLICABLE

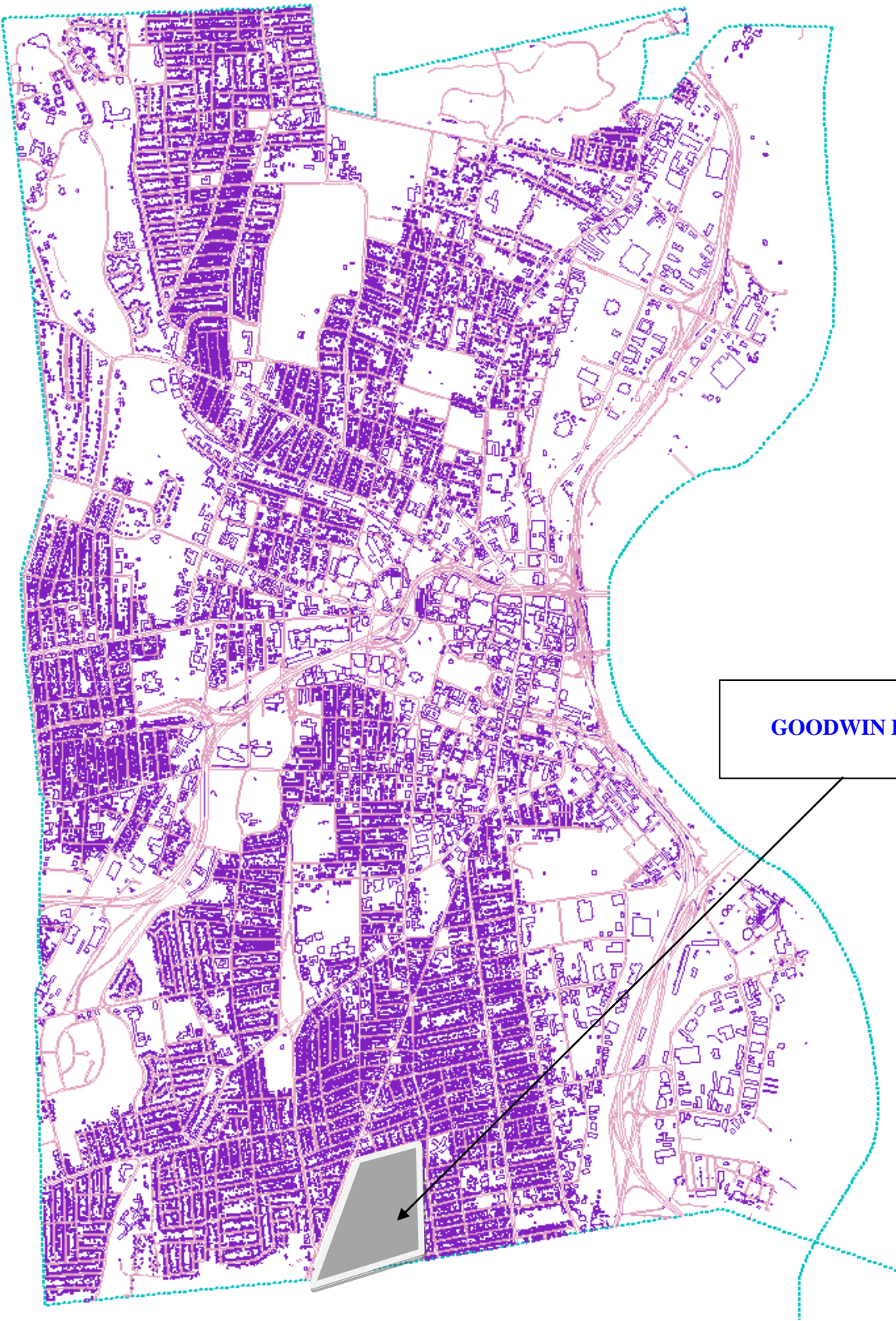
PLANS AVAILABLE AS PART OF BID DOCUMENTS: YES NO

SPECIAL INSURANCE REQUIREMENTS: YES NO

CALENDAR DAYS ALLOWED FOR CONTRACT WORK: See City of Hartford Special Conditions

LIQUIDATED DAMAGES FOR LATE COMPLETION: \$500 PER DAY

DISCLAIMER: THIS SHEET IS PROVIDED FOR GENERAL INFORMATION ONLY AND IS SOLELY INTENDED TO ASSIST BIDDERS IN UNDERSTANDING THE GENERAL SCOPE OF WORK. BIDDERS MUST REFER TO SPECIFIC CONTRACT SECTIONS FOR DETAILS. IN THE EVENT OF A CONFLICT, THE PROJECT AND CONTRACT SPECIFICATIONS SHALL TAKE PRECEDENCE OVER THIS CONTRACT SUMMARY SHEET.



GOODWIN PARK

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CONTRACT NUMBER: DPW

BID TITLE: GOODWIN PARK IRRIGATION & BOOSTER PUMP IMPROVEMENTS

INVITATION TO RESPOND

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| Invitation to Respond |
| Standard Instructions |
| Request for Response (RFR) Affidavit |

GENERAL INFORMATION

| |
|------------------------------------|
| Construction Project Summary Sheet |
| Site Location Map |
| Table of Contents (this document) |

1.0 RESPONSE FORMS

| | |
|-----|---|
| 1.1 | Response Information and Signature Form |
| 1.2 | Response Pricing |
| 1.3 | Statement of Qualifications |
| 1.4 | Subcontractor Utilization Forms |

2.0 (This section intentionally omitted)

3.0 GENERAL INFORMATION FOR PREPARATION & DELIVERY OF A RESPONSE

| | |
|------|---|
| 3.1 | How to Respond |
| 3.2 | Questions and Addenda |
| 3.3 | Qualifications of Candidates Offering a Response |
| 3.4 | Obligations of the Candidate |
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| 3.7 | Response Development |
| 3.8 | Time Provisions |
| 3.9 | Correction or Withdrawal of Responses, Cancellation of Awards |
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| 3.21 | Subcontractors |
| 3.22 | Intentionally Left Blank |
| 3.23 | Intentionally Left Blank |
| 3.24 | Intentionally Left Blank |
| 3.25 | Criteria for Award |
| 3.26 | Notice of Award |
| 3.27 | Performance Evaluation |

SAMPLE FORM OF CONTRACT

| |
|---|
| Sample Form of Contract |
| Sample Performance Bond Included in this document by reference is available at: http://www.hartford.gov/purchasing/Documents.htm ; Document titled: <u>Sample Performance Bond AIA A312</u> |
| City of Hartford Special Conditions |
| Description of the Work |
| Hours of Work |
| Scheduling the Work |
| Construction Survey for Layout Purposes |
| As-Built Drawings |
| Additional Contract Documents |
| Permits |
| Testing of Materials |
| Supplementary Conditions |
| Subsurface Explorations |
| Environmental Conditions |
| |
| State Wage Rates |
| General Conditions |
| Notices to Contractor |

TECHNICAL SPECIFICATIONS

| |
|--|
| City of Hartford Standard Technical Specifications |
| Special Provisions of Specifications (Contained Herein) |
| Special Material Requirements |

City of Hartford Standard Technical Specifications are in the form of a compact disk available from the Department of Public Works. If you do not already have a copy of the Standard Specifications, copies can be picked up at the Department of Public Works located at 50 Jennings Road in Hartford, CT. Please contact Keith Rapoza at (860) 757-9984 to make arrangements to pick up the Standard Specifications.

LIST OF DRAWINGS

| DRAWING NUMBER | TITLE |
|-----------------------|---------------|
| TS-1 | TITLE SHEET |
| | |
| GN-1 | GENERAL NOTES |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

LIST OF CITY OF HARTFORD STANDARD DRAWINGS

| DRAWING NUMBER | TITLE |
|-----------------|-------------------------------------|
| SR-1 thru SR-10 | STANDARD ROADWAY AND STREET DETAILS |
| | |
| | |

Note – Standard Drawings are not provided herein and must be obtained by the Bidder thru the City of Hartford or State of Connecticut, Department of Transportation.

SAMPLE FORMS - included in this document by reference, are available at

<http://www.hartford.gov/purchasing/Documents.htm>
Document titled: Standard Construction Sample Forms:

Certificate of Non-segregated Facilities

Notification of Job Openings During Project

About Compliance Reports

Monthly Workforce Utilization Report

Section 1 RESPONSE FORMS

1.1 RESPONSE INFORMATION & SIGNATURE FORM

| | | | | |
|---|---|-------------------|---|---|
| Vendor Name - | | | | |
| Trade Name - | | | | |
| Address - | | | | |
| Phone # - | | Fax # - | Email Address - | |
| Contact Person - | | | Tax ID# - | |
| Delivery / Service Start Date: | | | # Calendar days after receipt of executed contract: | |
| Bid Surety - 10% | For electronic bonds enter bond number, otherwise check the appropriate box | Electronic Bond # | <input type="checkbox"/> Bond (hard copy) | <input type="checkbox"/> Cashiers / Certified Check |
| Cost of Performance Bond included in base bid (if applicable) | | | \$ | Per thousand |
| EEO Certification Status (check one) | | | <input type="checkbox"/> Current & on file with DOT | <input type="checkbox"/> EEO form attached |
| Insurance Agent Name | | Phone # | | |
| Insurance Agent Address | | | | |

Vendor acknowledges receipt of all addenda issued during the bidding period (if applicable) and understands that they are a part of the bidding documents.

The undersigned hereby declares that he/she or they are thoroughly familiar with the specifications, the various sites, the City's requirements, and the objectives for each element of the project item or service and understands that in signing this proposal all right to plead any misunderstanding regarding the same is waived. The undersigned further understands and agrees that he will furnish and provide all the necessary material, machinery, implements, tools, labor, services, and other items of whatever nature, and to do and perform all the work necessary under the aforesaid conditions, to carry out the contract and to accept in full compensation therefore the amount of the contract as agreed to by the Contractor and the City.

The undersigned hereby declares that no reason or persons other than those named herein are interested in this proposal, which is made without any connection with any other person or persons making any proposal for the same work and is in all respects fair and without collusion or fraud; that no person acting for or employed by the City of Hartford is directly or indirectly interested therein, or in the supplies or works to which it relates, or will receive any part of the profit or any commission there from in any manner which is unethical or contrary to the best interest of said City of Hartford.

The undersigned additionally declares that they are not debarred or suspended, or otherwise excluded from, or ineligible for, participation in City of Hartford, State of Connecticut, or federally funded projects (Executive Order 12549).

The Undersigned understands and acknowledges that the failure to comply with the requirements of the certifications contained in the Federal and State requirement section constitutes a non-responsive bid and thereby invalidates this entire bid proposal.

The undersigned certifies under penalty of false statement that the information provided in this response is true.

| | | | |
|--------------------------|--|------|--|
| Submitted by (Signature) | | | |
| Printed name and title | | Date | |

(Authorized Agent of Company)

1.2 RESPONSE PRICING

The following pages are to be completed with response pricing information. Follow the instructions as applicable and complete all sections of this document as required. Failure to do so may result in the rejection of your bid.

INSTRUCTIONS

Bidder is to write his Major Lump Sum Price (MLSP) in figures and words in the blank spaces provided below. The bidder shall write his unit bid price(s) in figures under the UNIT PRICE column and write his total amount for the item under AMOUNT. In case of discrepancies between amounts shown in words and amount shown in figures, BIDDER agrees that amounts shown in words will govern.

The Bidder shall state the unit cost for each of the listed UNIT PRICE item(s). If unit price work is The Bidder is reminded to complete the DBE utilization commitment forms within this proposal to ensure that the minimum of 15% participation of the total bid price is achieved.

1. Major Lump Sum Price, Base Bid. The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by BETA Group, consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of Goodwin Park Irrigation & Booster Pump Improvements, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

| | |
|--|-----------|
| <p>MAJOR LUMP SUM PRICE BASE BID To set up and maintain site security & pedestrian detours. Set up and maintain entry gate tracking pad(s). Coordinate with the golf course for the maintenance & protection of traffic and citizens in the vicinity of the site. Set up and maintain erosion controls. Furnish & installation of equipment for the Park's new well pumps (2) and SCADA system. Backfill with suitable materials, compaction and grading. Furnish & install concrete pavement. Furnish & install HMA pavement. Furnish & install, reinforced concrete foundations, pump house and irrigation pumps. Electrical demolition as well as furnish and installation of a new irrigation power system throughout the park. Furnish & install a new irrigation system for the putting greens, holes 1, 7, 8, and 9 on the south course. and related work as specified, detailed, and shown on the contract drawings & specifications for the base bid. (Include the Owner's Contingency Allowance of \$100,000).</p> | <p>\$</p> |
| <p>MAJOR LUMP SUM PRICE BASE BID IN WORDS. (Include the Owner's Contingency Allowance of \$100,000)</p> | |
| | |

The Owner's Contingency Allowance is for the use of the Owner to make adjustments as deemed necessary. This sum, or portions thereof, shall not be paid to the Contractor unless authorized by the owner

The following add alternate bid items may be awarded to the base bid by the city if funding is available. The Contractor is advised to review the contract drawings and specifications to determine the full extent of the work for each alternate item and being familiarize themselves with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment, and services, including all scheduled allowances, necessary to complete the add alternate bid item according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

| | |
|---|----|
| ADD ALTERNATE #1 to provide all materials and conduct all work to install new irrigation system for the driving range and holes 1-9 on the north course and related work as specified, detailed, and shown on the contract drawings & specifications for the lump sum price of: (Include the Owner's Contingency Allowance of \$25,000). | \$ |
| MAJOR LUMP SUM PRICE ALTERNATE #1 IN WORDS. (Include the Owner's Contingency Allowance of \$25,000) | |
| | |
| ADD ALTERNATE #2 to provide all materials and conduct all work to install new irrigation system for the driving range and holes 2-6,11,16 and 16 on the south course and related work as specified, detailed, and shown on the contract drawings & specifications for the lump sum price of: (Include the Owner's Contingency Allowance of \$25,000). | \$ |
| MAJOR LUMP SUM PRICE ALTERNATE #2 IN WORDS. (Include the Owner's Contingency Allowance of \$25,000) | |
| | |
| ADD ALTERNATE # 3 to provide all materials and conduct all work to install new irrigation system for the driving range and holes 10, 12-15 and 18 on the south course. and related work as specified, detailed, and shown on the contract drawings & specifications for the lump sum price of: (Include the Owner's Contingency Allowance of \$25,000). | \$ |
| LUMP SUM PRICE ALTERNATE #3 IN WORDS. (Include the Owner's Contingency Allowance of \$25,000) | |
| | |

2. UNIT PRICES

The undersigned Bidder proposes the UNIT PRICE(S) below be used as the appropriate unit cost to calculate the value of work to be added to or deducted from the Contract Sum on performance of work ordered by the Engineer to make modifications and changes as deemed necessary. If the modification(s) result in an increase of work over the required under the MLSP work the additional cost shall be paid from the owners' contingency.

Unit-Price No. 1: Rock excavation and replacement with suitable fill.

_____ dollars and _____ cents (\$ _____) per cubic yard.

ACKNOWLEDGEMENT OF ADDENDA

3. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

- a. Addendum No. 1, dated _____.
- b. Addendum No. 2, dated _____.
- c. Addendum No. 3, dated _____.
- d. Addendum No. 4, dated _____.

Respectfully submitted this ____ day of _____, 2021.

Submitted By: _____ (Firm Name).

Authorized Signature: _____ (Handwritten signature).

Signed By: _____ (Type or print name).

Title: _____ (Owner/Partner/President/Vice President).

1.3 STATEMENT OF QUALIFICATIONS

Please complete the following information. Failure to respond to all items may result in the rejection of your response.

1. Number of years in business - _____ D-U-N-S Number: _____

2. Number of personnel employed Part time - _____, Full time - _____

3. List up to six past contracts of this type/size your firm has completed within the last three (3) years:

| Project | Date | Contact Person | Phone No. |
|---------|------|----------------|-----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| | | | |
|-----------------------------|--|--|--|
| 4. INTENTIONALLY LEFT BLANK | | | |
|-----------------------------|--|--|--|

| | | |
|---|--------------------------|--|
| 5. ORGANIZATIONAL STRUCTURE OF BUSINESS ENTITY (select one) | <input type="checkbox"/> | General partnership (GP) |
| | <input type="checkbox"/> | Limited partnership (LP) |
| | <input type="checkbox"/> | Limited liability corporation (LLC) |
| | <input type="checkbox"/> | Limited liability partnership (LLP) |
| | <input type="checkbox"/> | Corporation |
| | <input type="checkbox"/> | Individual doing business under a trade name (sole proprietor) |
| | <input type="checkbox"/> | Other (specify) |

| | | | |
|--|--|---------------------------------|--------------------------------|
| 6. CITY OF HARTFORD TAX STATUS / OTHER FINANCIAL OBLIGATIONS | <u>Hartford Businesses</u> – All City of Hartford taxes & financial obligations (real, motor & personal property) are current and paid in full or subject to a current and approved payment plan. Please attach RFR Affidavit. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| | <u>Non-Hartford Businesses</u> - All City of Hartford financial obligations are current and paid in full or subject to a current and approved payment plan. Please attach RFR Affidavit. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

| | | | |
|---|---|---------------------------------|--------------------------------|
| 7. STATUS OF THE BUSINESS AND ITS CURRENT STANDING WITH THE SECRETARY OF STATE'S OFFICE | <u>Connecticut businesses</u> - Are all required filings current with the Secretary of State and will the Secretary of State be able to issue a Certificate of Legal Existence? | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
|---|---|---------------------------------|--------------------------------|

| | | | |
|--|---|---------------------------------|--------------------------------|
| | <u>Out-of –State (foreign) businesses</u> – Have you filed a Certificate of Authority / Application of Registration with the Connecticut Secretary of State? If so, submit a copy of your filing with your response. If not, submit a copy of your Certificate of Good Standing from your state of incorporation. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
|--|---|---------------------------------|--------------------------------|

| | | | |
|--|-------|-----|--|
| 8. Is your local organization an affiliate of a Parent company? If so, Indicate the principal place of business of the parent company and the name of agent for service. | | | |
| Business Name | | | |
| Address | | | |
| City | State | Zip | |
| Name of Agent | | | |

9. List all Affiliated Businesses (attach additional sheets as necessary):

| Business Name | Address | Ownership Interest % |
|---------------|---------|----------------------|
| . | . | . |
| . | . | . |
| . | . | . |
| . | . | . |

10. Based on the organizational structure of your business, provide a current listing of all corporate officers, principals, general or managing partners, limited partners, managers and members. If sole proprietorship or general partnership, attach trade name certificate filed with the town clerks office.

11. Submit copies of all required business (trade & occupational) licenses with your response.

12. Your company may be asked to submit information relative to your company's financial statements and/or a Dun & Bradstreet report may be obtained prior to receiving an award. This information will be protected to the fullest extent required by law.

13. Additional information/documentation may be requested subsequent to your responding to this solicitation.

1.4 SUBCONTRACTOR UTILIZATION

Forms labeled Section 1.4 are provided below to accommodate the Base Bid (or Lump Sum) and alternates (if called for) in this Request for Response (RFR).

The information provided below applies to: (Check one box as appropriate)

| | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Base Bid | Alternate 1 | Alternate 2 | Alternate 3 | Alternate 4 | Alternate 5 |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

1.4 SUBCONTRACTOR UTILIZATION

If subcontractors are to be used, indicate the firm name, address, portion or section of work the subcontractor will be performing, the subcontract value, percentage of base bid and if the subcontractor is a ConnDOT certified (DBE). This information shall be provided in the time frame stated in the "State and Federal Requirements"

Respondent agrees to subcontract the portion of the work stipulated below to (DBE) businesses. A copy of the contract between the respondent and the subcontractor will be required prior to execution of contract.

Note: Connecticut General Statutes Section 4a-100, Prequalification now applies to subcontractors also.

| Trade or Nature of Work | BUSINESS NAME AND ADDRESS | ConnDOT CERTIFIED DBE | % of Base Bid | Subcontract \$ Value |
|-------------------------------|---------------------------|--------------------------|---------------|----------------------|
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| TOTAL SUBCONTRACT VALUE | | | | |
| TOTAL (DBE) SUBCONTRACT VALUE | | | | |

Subcontract % to total project %

DBE Subcontract % to total project

Additional information may be requested subsequent to your responding to this bid request.

The information provided below applies to: (Check one box as appropriate)

| | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Base Bid | Alternate 1 | Alternate 2 | Alternate 3 | Alternate 4 | Alternate 5 |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

1.4 SUBCONTRACTOR UTILIZATION

If subcontractors are to be used, indicate the firm name, address, portion or section of work the subcontractor will be performing, the subcontract value, percentage of base bid and if the subcontractor is a ConnDOT certified (DBE). This information shall be provided in the time frame stated in the "State and Federal Requirements"

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Note: Connecticut General Statutes Section 4a-100, Prequalification now applies to subcontractors also.

| Trade or Nature of Work | BUSINESS NAME AND ADDRESS | ConnDOT CERTIFIED DBE | % of Base Bid | Subcontract \$ Value |
|-------------------------------|---------------------------|--------------------------|---------------|----------------------|
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| TOTAL SUBCONTRACT VALUE | | | | |
| TOTAL (DBE) SUBCONTRACT VALUE | | | | |

Subcontract % to total project %

DBE Subcontract % to total project

Additional information may be requested subsequent to your responding to this bid request.

The information provided below applies to: (Check one box as appropriate)

| | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Base Bid | Alternate 1 | Alternate 2 | Alternate 3 | Alternate 4 | Alternate 5 |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

1.4 SUBCONTRACTOR UTILIZATION

If subcontractors are to be used, indicate the firm name, address, portion or section of work the subcontractor will be performing, the subcontract value, percentage of base bid and if the subcontractor is a ConnDOT certified (DBE). This information shall be provided in the time frame stated in the "State and Federal Requirements"

Respondent agrees to subcontract the portion of the work stipulated below to (DBE) businesses. A copy of the contract between the respondent and the subcontractor will be required prior to execution of contract.

Note: Connecticut General Statutes Section 4a-100, Prequalification now applies to subcontractors also.

| Trade or Nature of Work | BUSINESS NAME AND ADDRESS | ConnDOT CERTIFIED DBE | % of Base Bid | Subcontract \$ Value |
|-------------------------------|---------------------------|--------------------------|---------------|----------------------|
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| TOTAL SUBCONTRACT VALUE | | | | |
| TOTAL (DBE) SUBCONTRACT VALUE | | | | |

Subcontract % to total project %

DBE Subcontract % to total project

Additional information may be requested subsequent to your responding to this bid request.

The information provided below applies to: (Check one box as appropriate)

| | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Base Bid | Alternate 1 | Alternate 2 | Alternate 3 | Alternate 4 | Alternate 5 |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

1.4 SUBCONTRACTOR UTILIZATION

If subcontractors are to be used, indicate the firm name, address, portion or section of work the subcontractor will be performing, the subcontract value, percentage of base bid and if the subcontractor is a ConnDOT certified (DBE). This information shall be provided in the time frame stated in the "State and Federal Requirements"

Respondent agrees to subcontract the portion of the work stipulated below to (DBE) businesses. A copy of the contract between the respondent and the subcontractor will be required prior to execution of contract.

Note: Connecticut General Statutes Section 4a-100, Prequalification now applies to subcontractors also.

| Trade or Nature of Work | BUSINESS NAME AND ADDRESS | ConnDOT CERTIFIED DBE | % of Base Bid | Subcontract \$ Value |
|-------------------------------|---------------------------|--------------------------|---------------|----------------------|
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| TOTAL SUBCONTRACT VALUE | | | | |
| TOTAL (DBE) SUBCONTRACT VALUE | | | | |

Subcontract % to total project %

DBE Subcontract % to total project

Additional information may be requested subsequent to your responding to this bid request.

The information provided below applies to: (Check one box as appropriate)

| | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Base Bid | Alternate 1 | Alternate 2 | Alternate 3 | Alternate 4 | Alternate 5 |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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| Trade or Nature of Work | BUSINESS NAME AND ADDRESS | ConnDOT CERTIFIED DBE | % of Base Bid | Subcontract \$ Value |
|-------------------------------|---------------------------|--------------------------|---------------|----------------------|
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| TOTAL SUBCONTRACT VALUE | | | | |
| TOTAL (DBE) SUBCONTRACT VALUE | | | | |

Subcontract % to total project %

DBE Subcontract % to total project

Additional information may be requested subsequent to your responding to this bid request.

The information provided below applies to: (Check one box as appropriate)

| | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Base Bid | Alternate 1 | Alternate 2 | Alternate 3 | Alternate 4 | Alternate 5 |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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| Trade or Nature of Work | BUSINESS NAME AND ADDRESS | ConnDOT CERTIFIED DBE | % of Base Bid | Subcontract \$ Value |
|-------------------------------|---------------------------|--------------------------|---------------|----------------------|
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| | | <input type="checkbox"/> | | |
| TOTAL SUBCONTRACT VALUE | | | | |
| TOTAL (DBE) SUBCONTRACT VALUE | | | | |

Subcontract % to total project %

DBE Subcontract % to total project

Additional information may be requested subsequent to your responding to this bid request.

SECTION 3

GENERAL INFORMATION FOR PREPARATION AND DELIVERY OF A RESPONSE

Rev. 12/05/12

Definitions:

Request for Response (RFR) refers to any form of solicitation the City may use, such as a Request for Bids (RFB), Request for Proposal (RFP), Request for Information (RFI) or Request for Quotation (RFQ).

Candidate or Respondent refers to an individual or company who is considering or has submitted a response to a solicitation. This is also commonly referred to as "bidder."

City refers to the City of Hartford, the Hartford Public Schools and any other governmental entity participating in the RFR process and/or resulting award(s).

Provider refers to the Candidate or Candidates who receive an award and who enter into a contract with the City.

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3.1 HOW TO RESPOND: Supply the required information on and along with the response forms. An officer or explicit agent of your organization must sign the response form and any supplementary proposal document.

If this request has a "Specification Offered" column opposite the specifications, complete as follows and return these pages with your pricing sheet(s):

In the "specification offered" column type in:

- a) "As specified"
- b) "Exceeds specifications" - Identify what exceeds the specification and why
- c) "Exception to specifications" - Identify the substitute and define its effect

Failure to follow these guidelines may be just cause for rejection of the response.

3.2 QUESTIONS & ADDENDA: Questions related to this project must be received in writing 7 calendar days in advance of the response submittal deadline. Written questions must be sent via email to the buyer whose name appears on the invitation to respond. Responses shall be in writing and posted in the form of an addendum. Candidates are responsible for obtaining all addenda related to this RFR and thus advised to check for any addenda a minimum of twenty-four hours in advance of the response deadline.

The bids submitted for the work must be based upon the text of this document including the Standard instructions, Special Instructions, Specifications, all Addenda, and any referenced plans, and no oral or informal statement or representation by any representative or employee of the City of Hartford or the Architect shall be considered an amendment to or waiver of any statements in or requirement of such bidding or proposed contract documents and no claim or right of action shall accrue in favor of any respondent as a result of or founded on such oral or informal statements or representations. The City or its agents shall not be responsible for any oral instructions or interpretations given to a Candidate.

Note: All communications related to this project are to be directed to buyer noted on the invitation to respond. Candidates found to be communicating with City or School staff outside of the Procurement Services Unit will have their response rejected.

3.3 QUALIFICATIONS OF CANDIDATES OFFERING A RESPONSE: The City may make such investigations as deemed necessary to determine the ability of the Candidate to perform the work and the degree to which any Candidate meets the criteria for award listed herein. Each Candidate agrees to furnish the City any additional information requested.

3.4 OBLIGATIONS OF THE CANDIDATE: At the time of the opening of proposals, each Candidate will be presumed to be thoroughly familiar with the City's requirements, and the objectives for each element of the project, item or service. A plea of mistake in the accepted response shall not be available to the Candidate for the recovery of the bid surety or as a defense to any action based upon an accepted response.

3.5 NON-DISCRIMINATION: The candidate agrees and warrants that in the performance of the contract such candidate will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, mental retardation, mental or physical disability, in any manner prohibited by the laws of the United States or of the State of Connecticut.

3.6: INTENTIONALLY LEFT BLANK

3.7 RESPONSE DEVELOPMENT: Candidates are responsible for all costs and expenses incurred in the preparation of a response and for any subsequent work on the response that is required by the City of Hartford. Any submittal is the property of the City of Hartford and will not be returned.

3.8 TIME PROVISIONS: The content of any response submitted is to remain valid and available to the City for ninety (90) days from the day proposals are due.

3.9 CORRECTION OR WITHDRAWAL OF RESPONSES, CANCELLATION OF AWARDS. Correction or withdrawal of inadvertently erroneous bids, including corrections to pricing must be submitted to the Procurement Agent prior to the bid response deadline. Corrections before or after award, or cancellation of awards of Contracts or Purchase Orders based on such mistakes, may also be permitted with the approval, in writing, of the Procurement Agent, otherwise withdrawal of bid by respondent shall be cause for forfeiture of bid surety to the City.

3.10 QUANTITIES AND/OR USAGES: Quantities and/or usages are estimates only and in no way represent a commitment and/or intent to purchase the estimated amount. Actual quantities and delivery locations may vary. The City reserves the right to order all quantities that may be needed, at the contract price, during the contract term regardless of the estimates provided in this RFR.

3.11 ACCEPTABLE BRANDS: The RFR specifications are not intended to limit consideration to the particular service organization or manufacturer from which they were developed. References to brand names or numbers are to be interpreted as establishing a standard of quality, unless specifically limited by the term "no substitute", otherwise brand names used within these specifications shall be presumed to be followed by the words "or approved equal". Burden of proving a product and/or material as equal to a specific product and/or material by brand name is the responsibility of the Provider. Final determination as to what is an "or equal" product will be made by the Procurement Agent in conjunction with other City staff. The City will award on the basis of the criteria stated herein, and reserves the right to waive or require compliance with any element of the specifications.

3.12 SAMPLES: Samples are furnished free of charge and may be held for comparison with deliveries. Candidate must arrange for their return if desired. Samples are assumed to meet, at a minimum, City specifications for quality. All deliveries shall have at least the same quality as the accepted proposal sample. Latent deficiencies will be remedied by the contractor at no additional cost, or loss of service, to the City.

3.13 SITE INSPECTION: Information contained in these documents is provided in good faith only that all Candidates may have access to the same information utilized by the City, and is not intended as a substitute for personal investigations, interpretations and judgment of the Candidate. As information may be approximated or incomplete, Candidates should conduct a thorough inspection, review of existing conditions/equipment, examination of the site and compare it to the specifications and drawings. Any discrepancies or needs for clarifications must be brought to the attention of the department managing the RFR prior to the bid opening.

Pre-bid / Response conferences are noted on the invitation to respond. Submission of a bid shall be evidence that respondent has examined the site, compared it with the drawings and specifications and satisfied itself of the conditions existing at the site, the storage and handling of materials, and all other matters incidental to the work under this contract. No additional compensation will be allowed for difficulties which the respondent could have discovered or reasonably anticipated prior to bidding.

3.14 CONTRACTING: The City reserves the right to require the successful Candidate to execute a contract in a format supplied by the City. The terms and conditions of the contract to be signed upon the award of the RFR will supersede any inconsistent provision of the RFR documents.

The award of any contract is subject to the following conditions and contingencies:

- (1) The approval of such governmental agencies as may be required by law.
- (2) The appropriation of adequate funds by the proper agencies.
- (3) Compliance with all applicable laws, regulations, ordinances and codes of the United States, the State of Connecticut and the City of Hartford.
- (4) The selected Candidate must be current in all tax or any other monetary obligation owed to the City of Hartford.
- (5) The selected Candidate must have a current EEO certification on file with the State.

3.15 CONTRACT DOCUMENTS: The Contract documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), this Request for Response (RFR) and its referenced documents, General and Supplementary Conditions, drawings, any Addenda issued, the Contractor's response to the RFR, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a Minor change in the Work issued by the Design Professional on behalf of the City; the Contract Documents do include other documents such as bidding requirements.

3.16 RETAINAGE (Construction/Infrastructure projects only): When progress payments are being made for items being built or designed, the City may withhold at least 5% of the total project cost, or as otherwise specified in the contract for this project.

3.17 INSURANCE: Refer to the exhibit noted on the Invitation to Respond for specific insurance requirements. List the name and address of the respondent's insurance agent on the response form. The successful candidate shall be required to furnish a Certificate of Insurance (Accord Form), acceptable to the City and Greater Hartford Transit District, within ten (10) days from notice of award and must name the City and Greater Hartford Transit District as an additional insured on the face of the document. The insurance certificate and coverage requested must be updated and kept current throughout the life of the contract, including any extensions. If at any time during the term of the contract or any extension thereof, any required policies of insurance should renew, expire, or be cancelled, it will be the responsibility of the Provider to furnish to each of the City and Greater Hartford Transit District a Certificate of Insurance indicating renewal or an acceptable replacement of the expiring policy prior to the expiration or cancellation, so that there will be no lapse in any coverage. The candidate shall obtain and maintain such required insurance at its own cost and expense.

3.18 BID BONDS: A Bid bond, cashiers or certified check may be required with your response. The City of Hartford provides contractors with the option of submitting an electronic Bid Bond through the Surety2000 website. Surety 2000 is an Internet-based surety processing, verification and security system, developed in cooperation with the surety industry. You may contact Surety 2000 at 1-800-660-3263 or www.surety2000.com, for more information.

Certified checks will be returned to all unsuccessful Candidates upon the awarding of the contract. If your response is not accompanied by a bond, certified check or proof that a valid bond has been obtained at the RFR opening it may be rejected.

If you manage a small business and have difficulty obtaining bonds help is available from the Small Business Administration (SBA) through "The Surety Bond Guarantee Program. For more information go to www.sba.gov, choose "Services." Then select "Financial Assistance" and click on "Surety Bond."

3.19 PERFORMANCE BOND AND PAYMENT BOND: If requested, the successful contractor will be required to submit a Performance Bond and Payment (Labor & Material) Bond in the amount of 100% of contract award within 10 days of award if the contract value exceeds \$50,000. Said bonds shall be issued by an insurance company and said surety companies must be listed on the current Federal Register, licensed in the State of Connecticut with an underwriting limitation exceeding the value of the project with no more than 5% of capital in surplus tied to any one risk. Banks must have a branch office in Connecticut with insurance provided by the FDIC. The bonds must be signed by an officer of the company and of the surety company above their official titles and their corporate seals must be affixed over the signatures.

3.20 PREVAILING WAGES (Construction/Infrastructure projects only): Pursuant to Section 2-559 (B), Required Provisions. Each Agreement for the construction, remodeling or repair of any Infrastructure Facilities shall contain both of the following provisions:

(1) "The wages paid to any mechanic, laborer or workman employed upon the work herein contracted to be done shall be at a rate equal to the prevailing wage rate in the State of Connecticut and or federal government, whichever is applicable, for the same work in the same trade or occupation."

(2) "Each contractor and subcontractor, or an authorized officer or employee, responsible for supervision of the payment of wages shall submit, on a weekly basis within seven (7) days after the regular payment date of the payroll period, to the Procurement Services Unit, a "Weekly Certified Statement of Compliance." Due and timely compliance with this provision shall be a condition precedent to the approval and transmittal of the next and succeeding payments by the city or its authorized officers or agents to the contractor under the terms of this agreement."

3.21 SUBCONTRACTORS: The respondent shall not subcontract any portion of the project to be performed unless the prior consent of the City is given for both the work to be subcontracted and the subcontractor to perform the same. The terms and conditions of the underlying contract between the City and Contractor will become part and parcel of the terms and conditions of each subcontract. Respondents are required to provide subcontractor information in the space provided in 1.4 "Subcontractor Utilization" of the response forms. Complete a separate form for the Base Bid and each Alternate. DBE's must be certified with the State of Connecticut at the time of response submission.

3.22: INTENTIONALLY LEFT BLANK

3.23: INTENTIONALLY LEFT BLANK

3.24: INTENTIONALLY LEFT BLANK

3.25 CRITERIA FOR AWARD: This Request for Response does not necessarily contemplate an award based solely on price. Rather, the City reserves its rights to accept or reject any or all responses or any portion thereof that it may determine to be in its own best interests, for whatever reason.

3.26 NOTICE OF AWARD: The selected vendor will be provided with a written Notice of Award which

shall be contingent upon the submission by the respondent of all documents required of the successful candidate, including, but not limited to, proper insurance certificates, performance and payment bonds, verification of DBE percentage contribution to the work and execution of contract within 10 days of the notice of award.

3.27 PERFORMANCE EVALUATION: The Contractor understands that during the course of and at the conclusion of the project that the City will evaluate his/her overall performance. Based on information gathered from the City's project management team, the Procurement Agent will assess factors including, but not limited to, quality of work or service, completion record, job supervision, working relationship with other providers, bills for extras, organization, cooperation, worksite cleanliness and compliance with State DBE requirements. This evaluation will be considered in the issuance of future awards. The contractor further understands and agrees that this record will be available for public scrutiny for a minimum of two years.

END OF SECTION

CONTRACT
FOR PUBLIC WORKS PROJECTS

CONTRACT

This agreement, made by and between the City of Hartford, a municipal corporation organized and existing under the laws of the State of Connecticut with principal address of 550 Main Street, Hartford, CT 06103, acting herein by its Mayor, duly authorized, (the "City") and _____ (the "Contractor").

1. a) Contract Work: Contractor shall and will, at his, its or their own proper charge, cost and expense do and perform all the work and furnish all materials and labor necessary or proper, and build in a good, firm and workmanlike manner, in accordance with the Contract Documents which are a part hereof, and in accordance with such further plans and directions as have been made or may be made from time to time as the work referred to in the information for bidders, accompanying this contract, vis.:

**Request for Response
GOODWIN PARK IRRIGATION & BOOSTER PUMP IMPROVEMENTS
Hartford, Connecticut**

Contract Number DPW

All to be in accordance with the terms of the proposal for said work submitted to the Procurement Manager of the City of Hartford, accepted by the Committee of Award and made part of this contract.

- (b) Contract Sum: The City shall pay the Contractor the Contract Sum for the Contractor's performance of the Contract. The Contract Sum is _____ **Dollars** and _____ **Cents** (\$_____). The Contract Sum is based on Unit Prices set forth in the Contractor's proposal and attached hereto as Exhibit _____ A.

2. Engineer To Be Judge: The City Engineer ("Engineer") of the City of Hartford and his duly authorized representatives, shall be the judge of the character, nature and fitness of all work done and materials furnished under this contract, and of the amount, quality, and classification of the several kinds of work for which payment is made, and he shall decide as to the meaning, intent, and performance of this contract. The entire work shall be done under his supervision and to his satisfaction, and his estimates and his decisions upon all questions relating to said work shall be a condition precedent to the right of said Contractor to payments under this agreement. Inspectors, so-called, shall not be deemed authorized to accept notices or waive any of the provisions hereof or modify any order or orders of said Engineer.

3. Changes and Extra Work: The Engineer may, in writing, and without notice to surety, alter and change the line, grade, plan, form, position, dimensions or materials of the work herein contemplated, or any part thereof, in a manner not inconsistent with the general layout of said improvement, either before or after its commencement, or may order in writing any extra work which he may deem necessary in connection therewith. If such alterations diminish the quantity of work to be done they shall not be made the basis of a claim for damages, or for anticipated profits on the work that may be dispensed with; if they increase the amount of work, such increase shall be paid for according to the quantity actually done, and at the price established for such work under this contract; or in case there is no price established, it shall be paid for at its actual reasonable cost, as determined by the Engineer, plus 15 percent of said cost, plus also the actual cost of insurance and special taxes figured on labor payrolls which the Contractor is required to pay, or at unit prices mutually agreed upon before commencing said work; provided, however, that no payment for extra work done or materials furnished shall be made unless such extras shall have been ordered in writing by the Engineer.

Should alterations in the character of the work be, in the opinion of the Engineer, productive of increased cost or result in decreased cost to the Contractor, a fair and equitable sum therefore, to be agreed upon in writing by the Contractor and the Engineer before such work is begun, shall be added to or deducted from the contract price, as the case may be.

4. Extra Claims To Be Made Promptly: No claim for payment in addition to the amount so awarded, on account of extra work done or materials furnished or damaged sustained, shall be considered unless the Contractor shall make the same to the Engineer, in writing, within twenty days after the date of the estimate when such award is made - or in case there is no award, then within twenty days after the date of the estimate next following the doing of the work or the sustaining of the damages for which said compensation is claimed - and shall, when requested, file with the Engineer an itemized statement of, and vouchers for, the quantities and prices of such work, materials, or damages; and it is agreed that the filing of said claim as above specified (together with said statement and vouchers when requested) shall be a condition precedent to the right of the Contractor to receive an additional compensation under this contract.
5. a. Contractor's Control of Work-Assignment: The Contractor shall perform with its own organization Contract work with a value of at least **50%** of the original total Contract value. The Contractor shall not assign this contract or any interest therein, nor sublet any part of the work contemplated hereunder, nor part with control or charge thereof, without the written consent of the Engineer. Any such attempted assignment or subletting shall, at the option of the Engineer, forthwith work an avoidance of this contract, or may be treated by the Engineer as null and void.

The Contractor may, with the consent of and subject to the approval of the Engineer in each case, employ sub-contractors to supply material and perform parts of the work required herein. But the Engineer shall be notified in advance and his written approval secured before sub-contractors are employed on the work. The employment of sub-contractors will not relieve the Contractor of full responsibility for all parts of the work.

- b. Contractor To Have Superintendent: The Contractor shall keep a competent superintendent on the job premises whenever any work is being done who shall receive orders in the Contractor's absence, and the Contractor shall obey them as if received by him personally.
6.
 - a. Contractor Responsible For Whole Work: The Contractor shall be responsible for the entire work until its final acceptance, and any unfaithful or imperfect work or defective material that may be discovered at any time before said final acceptance shall be immediately corrected or removed by said Contractor on requirement of the Engineer.
 - b. Defects: In case the nature of the defects is such that it is not expedient to have them corrected, the Engineer shall have the right to deduct from the amount due the Contractor on the final settlement of the accounts such sum of money as he considers a proper equivalent for the difference between the value of the materials or work specified and that furnished, or a proper equivalent for the damage.
 - c. Examinations: The Contractor shall at any time make such openings, and to such extent, to or through such part or parts of the said structures as the Engineer shall direct, and he shall restore the part of the work so disturbed to the satisfaction of the Engineer. Should the work or materials be found defective in any respect, the whole of the expense incurred thereby shall be defrayed by the Contractor, but, if otherwise, by the City.
 - d. Partial Payment Not Acceptable: It is also agreed that this is an entire contract for one whole and complete work, and that no partial payments on account by the City, nor the presence of the Engineer or inspectors, or their supervision or inspection of work or materials, nor the use of parts of the proposed structure shall constitute an acceptance of any part of the work before its entire completion and final acceptance.
7. May Be Used Before Completion: The City shall have the right to use any of the work or structures herein described or may grant permission to any person or persons to use or make connections therewith during the progress of the work herein contracted for, and the Contractor shall not interfere with nor obstruct such use. No extra allowance shall be made to said Contractor on this account, nor

shall such use be construed to constitute approval or acceptance by the City of any part of the work.

If repair or replacement of any portion of the project becomes necessary because the Engineer has directed that said portion be opened to travel or occupancy prior to completion of the Contract work, the Contractor shall perform that repair or replacement. The Contractor shall perform such work at its own expense, unless the City or an arbiter of competent jurisdiction shall determine definitely that the damage necessitating the repair or replacement was caused by equipment operated by a City employee while controlling snow or ice, or by routine City maintenance operations. In the latter cases, the City shall reimburse the Contractor for the cost of the repair or replacement. If the damage was caused by a traffic accident involving only a vehicle or vehicles that were not owned by the City and were not operated by an agent of the City, the Contractor may seek recovery from the responsible parties, but not from the City.

8. a. Commencement And Completion of Work: The Contractor shall commence work on the date stated in the Special Conditions issued pursuant to this contract and shall prosecute the same in such sections and in such order as the Engineer may direct, and shall complete the said structures and all work connected therewith by the date stated in the Special Conditions issued pursuant to this Contract.
- b. Extension Of Time: If the Contractor is delayed in the prosecution or completion of the work by or on account of any act or omission of the City, or by strikes or causes beyond control of the Contractor, he shall be entitled to such reasonable extension of time for the completion of the work as may be decided upon by the Engineer, provided, however, that no claim for an extension of time for any reason shall be allowed unless, within three days after such delay occurs, notice in writing of the fact of said delay, its causes, and the extension claimed, shall be given by the Contractor to the Engineer.
- c. Liquidated Damages: The Contractor agrees that the City may retain **\$500** per calendar day from the amount of the compensation to be paid the Contractor as liquidated damages. Liquidated damages shall be assessed for each calendar day that the work remains incomplete in excess of the number of calendar days stipulated for either (but not simultaneously) substantial completion or final completion as set forth in the Special Conditions issued pursuant to this Contract. This amount is agreed upon as the proper measure of liquidated damages which the City will sustain per day by failure of the Contractor to complete the work within the number of calendar days stipulated.

9. a. Maintenance: The Contractor agrees to keep and maintain the work in good repair for such period and in such manner as may be set forth and defined in Section 15 of the General Conditions.
- b. Engineer May Make Repairs: Whenever, before the expiration of the above specified maintenance period, the Engineer shall give written notice, postage prepaid, to the business address of the Contractor, to make any repairs so required, and if the Contractor shall fail to make such repairs to the satisfaction of the Engineer within ten days from the date of mailing of said notice, then the Engineer shall have the right to employ such other person or persons as he may deem proper to make the same, and the City shall pay the expense thereof out of any money otherwise due to the Contractor. It is however, mutually agreed that the Engineer, at his discretion, and at the Contractor's expense, may make repairs without notice to the Contractor in cases where, in his opinion, public safety requires such work to be done at once.
10. a. Contractor's Duties and Liabilities: The Contractor shall comply with all local, state, and national laws and regulations, and with all City ordinances in the prosecution of the work, and shall secure all necessary permits and licenses.
- b. Insurance Requirements:
1. Insurance requirements shall be per City of Hartford Document #1007 – “Construction Insurance Requirements” as referenced in Section 3 - General Information for Preparation and Delivery of a Response for Construction Projects or as specified in Section 1.03.07 of the *State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction Form 816*, whichever limits are greater. Insurance coverage shall remain full force for the duration of the contract, including any and all extensions. All renewal certificates shall be furnished at least 30 days prior to policy expiration. The City of Hartford and the Greater Hartford Transit District must be named as an additional insured.
- The insurance requirements shall apply to all subcontractors.
 - All policy forms shall be on the occurrence form. Exceptions must be authorized by the City's Risk Manager unless the coverage is not for Professional Liability where the common form is claims made.
 - Acceptable evidence of coverage will be on the ACCORD form or a form with the same format.
 - Each certificate shall contain a 30 day notice of cancellation.

- Insurance shall be issued by an insurance company licensed to conduct business in the State of Connecticut.

- c. Contractor Shall Protect the Public: The Contractor shall execute the work in such a manner as to interfere as little as possible with public travel, shall provide railings or suitable barricades to exclude persons and animals from trenches and obstructions, and to prevent accident or injury to workmen, other persons, vehicles, or animals; shall cause a sufficient number of lights to be kept burning on or near the work from twilight in the evening until sunrise, shall furnish, set and maintain such "street closed", "dangerous," "detour," or other signs as may be necessary for the convenience of traffic or as may be directed by the Engineer, and shall employ a watchman or additional safeguards when and as necessary, or when required by the Engineer.

- 11. a. Avoidance of Contract: If the work to be done under this agreement shall be abandoned, or at any time suspended for three days without reasonable cause, or if this contract shall be assigned without the written consent of the City Manager, or if at any time the Engineer shall be of the opinion that the said work is unnecessarily or unreasonably delayed, or that the Contractor is willfully violating any of the conditions or agreements of this contract, or that the progress of the work is, in his opinion, being so delayed that said work cannot be completed within the required time, the Engineer may give notice, postage prepaid, to the Contractor, at his business address, to that effect. If the Contractor shall not, within ten days after the mailing of such notice, take such measures as will, in the judgment of the Engineer, insure the satisfactory completion of the work, he may notify the Contractor, in writing, to discontinue all work under this contract; and it is hereby agreed that the Contractor shall thereupon at once stop work and cease to have any right or claim to possession of the ground, or such part thereof as the Engineer may designate; and the City may, by means of such other agents or contractors as shall to it seem advisable, complete the work herein described, or such part thereof as it may deem necessary, and may take possession of and use such implements, tools, and materials or facilities used for or in connection with the operations or the fulfillment of this contract, except as otherwise provided. The Contractor shall not remove any portion of the plant or any materials after receiving such notice as aforesaid. And said City is hereby authorized and empowered to apply sums of money due or to become due to said Contractor under this contract by way of reduction in damages, and as part payment of such additional expense incurred by the City as aforesaid.

- b. Engineer May Protect Work: It is, however, mutually agreed that the Engineer, at his discretion and at the Contractor's expense, may immediately, upon the cessation of work or thereafter, take measures to

protect the work under construction, the adjacent ground, pipes, and other structures where in his opinion safety requires such work to be done at once.

12. a. Payments: The City will pay and the Contractor will receive, as full compensation for furnishing all materials, labor and equipment for doing all work, assuming all duties, risks, and liabilities, and all obligations required by this contract, the amount stated in the proposal, or the sums of money computed at the several unit prices stated in the proposal submitted by the Contractor to the Purchasing Agent. A copy of the proposal is made part of this contract. The City may make such deductions from these sums as provided for in this contract.

No advance payment will be made to the Contractor for construction materials purchased in advance and stored by the Contractor. All materials will be paid for complete and accepted in-place according to the contract bid prices.

- b. Monthly Estimate: The Engineer may, once in each calendar month, make an estimate in writing of the total amount of work done and an allowance for the value of materials delivered to the time of such estimate. The City may retain five (5) percent of such estimated value as part security for the fulfillment of this contract by the Contractor, and shall monthly, or as nearly monthly as the practices of the disbursing officers of the City permit, pay to the Contractor, while carrying on the work, the balance, not retained as aforesaid, after deducting therefrom all previous payments and all sums to be kept or retained under the provisions of such of this contract. But is understood that estimates are approximate only, are subject to adjustment on the final estimate, and that they shall be made only when the work progresses in accordance with the provisions of this contract.
- c. Final Estimates: The Engineer shall, as soon as practical after completion of all work under this contract, make a final determination of the amount of work done thereunder and the value of such work. The City shall within sixty (60) days after such final determination is so made and is approved by the Director of Public Works, pay to the Contractor the balance, after deducting all previous payments and all sums to be kept or retained under the provisions of this contract. No interest is to be allowed or paid by the City upon any moneys retained under the provisions of this contract.
- d. Money Retained: The City may, at its discretion and at any time, withhold so much of any payments due to the Contractor, or to become due under this contract, as it may deem necessary to settle all claims against the Contractor which may arise under this contract, including all claims for labor or materials furnished to the Contractor, notice of which shall have been filed in the office of said City Engineer, and may retain the same until the

Engineer shall be satisfied that the said City, its agents and servants will be fully protected from any loss and indemnified for all damage for which the Contractor may become liable, and that all parties who may have claims against the Contractor for work done or materials furnished on account of this contract have been fully paid.

13. Contract Documents: The Contract Documents consist of this Contract, including the Special Conditions, State and Federal Requirements (if applicable), General Conditions, Special Provisions, Supplemental Conditions Technical Specifications, Project Manual, Contractor's Proposal, Addendum (No addenda was issued for this project), plans and drawings referenced in the Request For Response and documents referenced in the *Contract Documents* Section of the Special Conditions. The general features of said work are shown on the drawing on file in the office of the City Engineer, referred to in the proposal for this work which are made a part of this contract. The Engineer shall furnish the Contractor with such additional plans as may be necessary to show the details of construction, which are to be considered as illustrating the requirements set for in this contract and specifications and are to be followed by the Contractor in carrying out the work done hereunder.
14. Authority And Duties Of Inspector: An Inspector is a representative (but not a duly authorized representative as referred to in Article 2 of this Contract) of the Engineer assigned to make any and all necessary inspections of the work performed and materials furnished by the Contractor. Inspectors shall be authorized to inspect all work done and materials furnished. Such inspection may extend to all or any part of the work and to the preparation or manufacture of the materials to be used. In case of dispute arising between the Contractor and the Inspector as to materials furnished or the manner of performing the work, the Inspector shall have the authority to reject material or suspend the work until the question at issue can be referred to and decided by the Engineer. The Inspector shall not be authorized to revoke, alter, enlarge, relax or release any requirements of the specifications nor to approve or accept any portion of the work, nor to issue instruction contrary to the plans and specifications, nor will he act as foreman or perform other duties of the Contractor. Any advice which the Inspector may give the Contractor will in no way be construed as binding the Engineer or City in any way nor releasing the Contractor from the fulfillment of the terms of the said Contract.
15. Fair Employment Practices: The Contractor hereby agrees that neither he nor his subcontractors will refuse to hire or employ or to bar or to discharge from employment an individual or to discriminate against him in compensation or in terms, conditions or privilege of employment because of race, color, religious creed, age, sex, marital status, national origin, ancestry, present or past history of mental disorder, mental retardation, learning disability or physical disability,

including, but not limited to, blindness, except in the case of bona fide occupational qualification or need.

The Contractor further agrees that neither he nor his sub-contractors will discharge, expel otherwise discriminate against any person because he has opposed any discriminatory employment practice or because he has filed a complaint or testified or assisted in any proceeding under Section 46a-82, 46a-83 or 46a-84 of the Connecticut General Statutes. The advertisement of employment opportunities will be carried out in such manner as not to restrict such employment so as to discriminate against individuals because of their race, color, religious creed, age, sex, marital status, national origin, ancestry, present or past history of mental disorder, mental retardation, learning disability or physical disability, including, but not limited to, blindness, except in the case of a bona fide occupational qualification or need.

The terms stated above are taken from Section 46a-60 of the Connecticut General Statutes, "Discriminatory Employment Practices Prohibited."

16. Payment of Sub-Contractors and Material Suppliers: The Contractor, within 10 days after payment to such Contractor by the City, shall pay any amounts due sub-contractors and material suppliers, whether for labor performed or materials furnished, when such labor or materials have been included in a requisition submitted by such Contractor and paid by the City.
17. Indemnification & Hold Harmless: Contractor shall indemnify, defend and hold harmless the City and the State of Connecticut, and its agents, officials, employees, successors and assigns (collectively, the "Indemnitees") from and against any and all loss and liability (statutory or otherwise), claims, demands, actions, causes of action, suits, judgments, costs, executions, interest and expense whatsoever (hereinafter, individually and collectively, a "Claim" or "Claims"), in law or in equity, which arise from or in connection with Contractor's performance or failure to perform hereunder and/or any other act, error or omission which occurs or fails to occur on the part of Contractor or any of its directors, officers, partners, members, agents or employees under or in connection with this Contract or the Project during the term hereof. Contractor's obligations to defend, indemnify and hold harmless the Indemnitees as aforesaid shall include, but not be limited to, protecting the Indemnitees from all Claims for or arising from (i) any failure by Contractor to pay for any goods or services obtained by it hereunder, (ii) any negligent act, error or omission on the part of Contractor or any of its directors, officers, partners, members, agents or employees in the acquisition or provision of any goods or services hereunder, and (iii) any injury (including death) to persons, or damage to real or personal property (including the loss of use thereof and environmental contamination), which results from any act, error or omission on the part of Contractor or any of its directors, officers, partners, members, agents or employees under or in connection with this Agreement. In case any action or

proceeding is brought against any of the Indemnitees by reason of any matter which is the subject of the foregoing indemnity, Contractor shall pay all costs of investigation and defense (including, but not limited to, all court costs, reasonable attorneys' fees, and out-of-pocket expenses), and all losses and liabilities which result therefrom. The provisions of this Section shall survive the expiration or earlier termination of this Contract.

18. Claims For Consequential Damages: The Contractor and City waive claims against each other for consequential damages arising out of or relating to this Contract. This waiver includes, but is not limited to, damages incurred by Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the work required by the Contract Documents.
19. Default by Contractor: Any of the following events constitutes a default under this Contract.
 - a) If the Contractor fails to comply with one or more of the provisions of the Contract Documents;
 - b) If the Contractor made any misrepresentation in any affidavits, disclosures, certifications, statements and representation in the Contractor's submission;
 - c) If the Contractor does not comply with the Equal Employment Opportunity requirements of the City of Hartford Municipal Code;
 - d) If the Contractor does not maintain its certification with the City of Hartford;
20. Compliance With Laws: Contractor shall perform all work in accordance with and subject to all applicable federal, state and local laws, statutes, regulations, ordinances, orders and permits.
21. Americans With Disabilities Act (ADA) Of 1990: Contactor agrees to abide by the provisions of the Americans with Disabilities Act (the "Act") of 1990; Public Law 101-336, as applicable.

In compliance with this law, Contactor shall not discriminate against a qualified individual with a disability because of the disability of such individual in regard to job application procedures, the hiring, advancement, or discharge of employees, employee compensation, job training, and other terms, conditions, and privileges of employment. No qualified individual with a disability shall, by reason of such disability, be excluded from participation in or be denied the benefits of services, programs, or activities of Contactor, or be subjected to discrimination by Contactor. No individual shall be discriminated against on the basis of disability in the full and equal enjoyment of the goods, services, facilities, privileges, advantages or accommodations provided by Contactor.

Any television public service announcement that is produced or funded in whole or in part under this Agreement shall include closed captioning of the verbal content of such announcement. Contactor shall not discriminate against any individual because such individual has opposed any act or practice made unlawful by the Act or because such individual made a charge, testified, assisted, or participated in any manner in an investigation, proceeding, or hearing under the Act.

Contacto shall not permit coercion, intimidation or threatening of, or interference with, any individual in the exercise or enjoyment of, or on account of his or her having exercised or enjoyed, or on account of his or her having aided or encouraged any other individual in the exercise or enjoyment of, any right granted or protected by the Act.

22. Delinquency In Obligations: Contactor hereby agrees that throughout the period of this Agreement, all taxes, contractual obligations and audit responsibilities owed to the City of Hartford shall be and remain current.
23. Non-Waiver: Any failure by City to insist upon the strict performance by the other of any of the terms and provisions hereof shall not constitute a waiver of that or any other of said other party's obligations hereunder, and each party hereto, notwithstanding any such failure, shall have the right thereafter to insist upon the strict performance by the other, of any and all of the terms and provisions of this Contract.
24. Non-Assignability By Contractor: This Agreement shall not be transferable or assignable by Contactor, by operation of law or otherwise, without prior written consent of City, which consent may be withheld in its sole and absolute discretion.
25. Severability: If any provision of this Agreement is held invalid, the remainder of this Agreement shall not be affected thereby if such remainder would then continue to conform to the terms and requirements of applicable law.

IN WITNESS WHEREOF, The parties hereto have hereunto set their hands and seal this _____ day of 2021.

Signed in presence of:

THE CITY OF HARTFORD

By _____
Luke Bronin, Mayor

Signed in presence of:

CONTRACTOR

By _____
Name:
Its:

Approved as to form and legality:

Howard Rifkin
Corporation Counsel

CITY OF HARTFORD SPECIAL CONDITIONS

CITY OF HARTFORD SPECIAL CONDITIONS

DESCRIPTION OF THE WORK

This is a **MAJOR LUMP SUM (MLS) PRICE PROJECT WITH UNIT PRICES**. Work under this project shall entail construction of a new irrigation system for a 27-hole golf course, new booster pump system with prefabricated building and related improvements within Goodwin Park, Hartford, CT.

In general, the Contractor is to complete the following work:

- Install erosion control and site preparation work
- Install underground pipes, wires, valves, and controls
- Install foundation and new pre-cast concrete building enclosure
- Install new booster pump assembly, SCADA, and controls
- Install irrigation system, controls and
- Install new electrical systems and services
- Install new bedrock well pumps and associated components
- Repair paths, parking areas, and lawns
- Demolition, abandonment, and removal of existing irrigation components
- Provide training and support for new systems

Basis of Payment

Major Lump Sum (MLS) work shall be paid for in accordance with the Contractors approved schedule of values, as allocated per specification section at the appropriate percent complete. Contract unit prices listed in the bid schedule, including all materials, tools, equipment, and labor incidental to the work will be paid for at the contract unit price as approved by the Engineer. Refer to section 01-2200 and 01-3100 of the specifications for more information regarding payment, MLS work and unit price work.

HOURS OF WORK

Work under this contract will be performed in accordance with special provisions included herein on Monday through Friday. Work on State or Federal Holidays or other specific non-holiday events as identified on the plans or within the specifications will not be allowed. The Contractor is notified that the Golf course is scheduled to remain open during the course of work on this project. The Contractor will be limited to interfering with no more than 2 holes of play at any given time. The Contractor shall be allowed to work the hours of **8:00am – 5:00 pm**. These work hours may be limited further to maintain traffic during certain peak hours or special events. These work hours may only be adjusted upon advance written approval of the Engineer. The Engineer reserves the right to periodically adjust the work hours in the interest of public safety.

SCHEDULING THE WORK

The contractor shall start work not more than ten (10) calendar days from the date of written Notice to Begin Work unless such notice specifically instructs the contractor to begin work at a later date. All work under this contract shall be completed within **220 days** (Substantial Completion) with the exception punch list items. The punch list work shall be completed within **240 days** (Final Completion).

Calendar days in this contract shall mean each consecutive day including Saturdays, Sundays, and Legal Holidays. In this case "Legal Holiday" shall be defined per the City of Hartford's Holiday Schedule, available from the Director of Human Resources & Labor Relations. The calendar days between December 1 and April 1 will be considered as "winter shutdown" and will not be included in computing the substantial or final completion dates. No extensions of time will be allowed for adverse weather conditions unless the number of days of inclement weather is substantially greater or conditions more severe than average for the calendar period as recorded by a recognized weather observation agency and the Contractor provides documentation at the end of each calendar month identifying these weather delays. Work on this project shall not be performed on Saturdays, Sundays, or Legal Holidays except by written consent and direction of the Owner.

Work shall proceed in an orderly fashion to minimize inconvenience to the abutting property owners. All contract work, including punch list items, shall reach final completion within **240 days**.

In the event the contractor requests to work extended work hours, work on "non-working days" (i.e., Saturdays, Sundays, or Legal Holidays) or if the project goes beyond the final completion date the City shall recover from the contractor, all costs of doing business associated with this work. The City also has the right to recover its costs of doing business if the engineer orders the contractor to perform work outside of normal working hours or during "non-working days" in order to correct deficient work. The City's costs of doing business include but are not limited to DPW staff time (i.e., the inspector, engineer, etc.) and private duty police officers. The City's costs associated with working extended work hours, working on "non-working days", or working after the final completion date will be calculated by the engineer monthly and this amount will be deducted directly from the contractor's next receiving report. The contractor will not be required to compensate the City for its costs of doing business under the following conditions: 1) Work is required during extended hours, Saturdays, Sundays, or Legal Holidays, to make the area safe and passable due to no fault of the contractor, and this work is specifically ordered by the engineer. 2) The engineer allows the contractor to work during the winter shut down period as long as the work hours are in accordance with the *Hours of Work* section above.

Note: Paving will not be allowed during the winter shut down period (Dec 1 – April 1) unless specifically authorized by the Engineer.

CONSTRUCTION SURVEY FOR LAYOUT PURPOSES

A competent State of Connecticut Registered Land Surveyor shall perform line and grade for purposes of construction layout. **The surveyor shall be hired by the Contractor and all costs associated with construction layout for this Project will be borne by the Contractor. The Contractor will not be compensated for this work unless a bid item appears in the proposal section of this document. If a bid item is included for this item, the Contractor shall be compensated at the rate established.** The Contractor shall be solely responsible for the preservation of all survey control points, staking, benchmarks, or other control as required for the satisfactory completion of the work.

The Engineer may, periodically check the work of the surveyor for accuracy. However, this in no manner relieves the Contractor of his responsibility for the accuracy of the work. Any inaccuracies or discrepancies found on the part of the Contractor, or surveyor, shall be immediately brought to the attention of the Engineer.

The Contractor shall submit the surveyor's name, registration number, and insurance certificate to the Engineer for his approval at least 10 calendar days prior to the start of work.

AS-BUILT DRAWINGS

During the course of construction activities, the Contractor shall record as-built information and changes made in the field on a set of Contract Drawings. Upon project completion the Contractor shall furnish to the owner a complete set of Electronic and Mylar as-built drawings which accurately record all "As-Built" conditions neatly showing above and below ground facilities. The drawings shall be stamped by a certified licensed surveyor (L.S.) registered in the State of Connecticut. Electronic and Mylar drawings shall be turned over to the Engineer prior to final payment of the project. Electronic drawings shall be in DWG format. As-built drawings are considered part of the general work of this contract and are not considered a pay item.

ADDITIONAL CONTRACT DOCUMENTS

The State of Connecticut "Standard Specifications for Roads, Bridges, and Incidental Construction" (Form 818), 2018, are hereby made part of this contract. Plans showing the location of work to be done under this contract will be provided to the Contractor and shall be considered part of the contract. All construction activities shall conform to the "City of Hartford Rules and Specifications Regulating Curb and Walk Layers and Street Excavation," 1997 revision.

Note: any references to previous editions of the State of Connecticut "Standard Specifications for Roads, Bridges, and Incidental Construction" shall be taken to mean Form 818.

PERMITS

The Contractor (or his designated sub-contractor) shall be required to secure and pay for all appropriate permits. The Contractor shall abide by the conditions of all permits provided within these specifications.

TESTING OF MATERIALS

Materials on the project may be subject to the testing requirements of Section 1.06 of the State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction Form 818. The contractor is advised to carefully read the contract documents along with each individual item specification and pay particular attention to the material requirements, testing requirements and submittal requirements (i.e., materials certificates) for each section. The contractor shall make every effort to assist the Engineer/Inspector in gathering material samples and shall supply the Engineer/Inspector with the required submittals (i.e., materials certificates, etc.) prior to placing any material. Please note that payment could be delayed for any material placed prior to obtaining a satisfactory test result. The contractor runs the risk of having to remove and replace, at his own expense, any work which was completed with materials that were not tested or that have failing test results.

STATE REQUIREMENTS

CERTIFICATION OF ELIGIBILITY

_____ hereby certifies that neither
(Name of Proposer)

it nor its "principals" is included on the U.S. Comptroller General's Debarred Bidders List.

Signature: _____

Firm: _____

The Proposer certifies to the best of its knowledge and belief that it and its principals

- A. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in this transaction by any Federal department or agency.
- B. Have not, within a three-year period preceding the date of this Proposal, been convicted of or had a civil judgment rendered against it for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction, violation of Federal or State anti-trust statues or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statement, or receiving stolen property.
- C. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in Paragraph B of this Certification.
- D. Have not, within a three-year period preceding the date of this Proposal, had one or more public transactions (Federal, State or local) terminated for cause or default.

Where the Proposer is unable to certify to any of the statements in this certification, such Proposer shall include an explanation in such regard with its Proposal.

THE UNDERSIGNED CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF 31 U.S.C. SECTIONS 3801 ET SEQ. ARE APPLICABLE THERETO.

(Check One)

_____ I DO CERTIFY

_____ I DO NOT CERTIFY

DATE: _____

SIGNATURE: _____

TITLE: _____

CERTIFICATION OF NON-COLLUSION

The Undersigned certifies, under penalties of perjury:

That this Proposal has been made by the Proposer independently, and has been submitted without collusion, and without any agreement, understanding, or planned common course of action with any other vendor of materials, supplies, equipment , or services described in this procurement document, designed to limit independent bidding or competition;

That the contents of the proposal have not been communicated by the Proposer or it's employees or agents to any person not an employee or agent of the Proposer or it's surety or any bond furnished with the proposal, and will not be communicated to any such person prior to the official awarding of this procurement.

That I have fully informed myself regarding the accuracy of the statement made in the certificate.

SIGNATURE: _____

NAME: _____

FIRM: _____

TITLE: _____

DATE: _____

CONTRACTOR'S STATEMENT ON SUB-CONTRACTORS

1. There are NO sub-Contractors associated with this proposal.

Authorized Signee: _____

Printed Name: _____

Title: Date: _____

For (Company): _____

OR

2. Listed below are sub-Contractors associated with this proposal. Additional sheets are attached as required. I _____ have also attached appropriate Disadvantage Business Certifications.

Name of Company: _____

Address: _____

Contact Person: _____

Telephone #: _____

E-mail: _____

Name of Company: _____

Address: _____

Contact Person: _____

Telephone #: _____

E-mail: _____

CERTIFICATION FOR DISADVANTAGED BUSINESS ENTERPRISE

It is the policy of the U.S. Department of Transportation that disadvantaged business enterprises as defined in 49 CFR Part 26 shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with State and/or Federal funds under this agreement.

The supplier or Contractor agrees to ensure that disadvantaged business enterprises as defined above have the maximum opportunity to participate in the performance of contracts and subcontracts financed in whole or in part with Federal funds provided under this agreement. In this regard all recipients or contractors shall take necessary and reasonable steps in accordance with 49 CFR Part 26 to ensure that disadvantaged business enterprises have the maximum opportunity to compete and perform contracts. Recipients and their contractors shall not discriminate on the basis of race, creed, color, national origin, age or sex in the award of federal assisted contracts.

The specific goal for this project is a minimum of **6%**.

Contractor will meet the DBE goal for this contract. Proposer is certified according to requirements of DOT 49 CFR Part 26 as a DBE eligible for participation in DOT assisted contracts, and will be performing _____ percent (_____ %) of the contract work.

Contractor will meet the DBE goal for this contract. If awarded this contract, proposer will subcontract with the DBE(s) listed below which will be performing a total of _____ percent (_____%) of the total dollar amount of contract work. Each DBE listed below is certified according to requirements of DOT 49 CFR Part 26 for participation in DOT assisted contracts.

| DBE Name and Address | Description of Work | Percent of Dollar Amount of Total Contract Work |
|----------------------|---------------------|---|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

(Attach additional sheets)

Contractor does not meet the DBE goal for this contract. Proposer certifies that it has made good faith efforts in accordance with the Invitation for Bids to meet the DBE goal, but, despite those efforts, has been unable to meet the goal. The Good Faith Efforts Documentation Form is attached to this Participation Form.

SIGNATURE: _____

NAME: _____

FIRM: _____

TITLE: _____

DATE: _____

Any contractor and/or sub-contractor utilized to meet the DBE Participation requirements must be certified through the State of Connecticut Department of Transportation's Unified Certification Program (UCP.)

DBE GOOD FAITH EFFORTS DOCUMENTATION FORM
ANNUAL DBE GOAL: 6%

If Contractor has indicated on the DBE Participation Form that it does not meet the DBE goal, proposer must submit this form with its DBE Participation Form as documentation of its good faith efforts to meet the goal. Failure to submit this form with its proposer may render this proposal non-responsive. The City of Hartford may require that proposer provide additional substantiation of good faith efforts.

Date: _____ Area of Expertise: _____
Name: _____ Company Name: _____
Response: _____

Date: _____ Area of Expertise: _____
Name: _____ Company Name: _____
Response: _____

Date: _____ Area of Expertise: _____
Name: _____ Company Name: _____
Response: _____

Date: _____ Area of Expertise: _____
Name: _____ Company Name: _____
Response: _____

Date: _____ Area of Expertise: _____
Name: _____ Company Name: _____
Response: _____

BUY AMERICA CERTIFICATION

The contractor agrees to comply with 49 U.S.C. 5323(j) and 49 C.F.R. Part 661, which provide that Federal funds may not be obligated unless steel, iron, and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 C.F.R. 661.7, and include final assembly in the United States for 15 passenger vans and 15 passenger wagons produced by Chrysler Corporation, and microcomputer equipment and software. Separate requirements for rolling stock are set out at 49 U.S.C. 5323(j)(2)(C) and 49 C.F.R. 661.11. Rolling stock must be assembled in the United States and have a 60 percent domestic content.

Certification requirement for procurement of steel, iron, or manufactured products.

Certificate of Compliance with 49 U.S.C. 5323(j)(1)

The bidder or offeror hereby certifies that it will meet the requirements of 49 U.S.C. 5323(j)(1) and the applicable regulations in 49 C.F.R. Part 661.5.

Date _____

Signature _____

Company Name _____

Title _____

Certificate of Non-Compliance with 49 U.S.C. 5323(j)(1)

The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. 5323(j)(1) and 49 C.F.R. 661.5, but it may qualify for an exception pursuant to 49 U.S.C. 5323(j)(2)(A), 5323(j)(2)(B), or 5323(j)(2)(D), and 49 C.F.R. 661.7.

Date _____

Signature _____

Company Name _____

Title _____

ELIGIBLE CONTRACTORS CERTIFICATE

I, _____, of _____,
(Name & Title) (Name of Firm)

hereby certify that it **IS** / **IS NOT** (circle one) included on the List of Parties Excluded from Federal Procurement and Non-Procurement Programs.

SIGNATURE: _____

NAME: _____

FIRM: _____

TITLE: _____

DATE: _____

STATE OF CONNECTICUT WAGE RATES

DPW ENGINEERING PROJECTS, GENERAL CONDITIONS

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1. **GENERAL**

These specifications are intended to apply to the execution of the work stated on the title page of this contract.

2. **DEFINITION OF TERMS**

Whenever in these specifications the following terms are used, the intent and meaning shall be as follows:

- a. *"City"* City of Hartford, Connecticut
- b. *"Public Works"* Department of Public Works and the City of Hartford
- c. *"Engineering"* Bureau of Engineering Services of the City of Hartford
- d. *"Municipal Building"* Executive Offices of the City of Hartford, 550 Main Street
- e. *"Director"* Director of Public Works or his authorized representative
- f. *"Engineer"* City Engineer or his authorized representative
- g. *"Inspector"* A representative of the Director, through the Engineer assigned to make the following:
 - All necessary inspections of condition of all sidewalks and curbs within the City accepted street and to recommend necessary repair work. All necessary inspections of repair, construction and materials of sidewalk and curbs, and street excavations.
- h. *"Street"* The word "street" shall be constructed to embrace streets, avenues, boulevards, highways, roads, alleys, lanes, viaducts, bridges, and the approaches thereto and all the other public thoroughfares in the City and shall mean all that part thereof from street line to street line of the premises abutting thereon.
- i. *"Laboratory"* The testing laboratory of the Bureau of Engineering or a commercial testing laboratory designated by the Engineer.
- j. *"Contractor"* A licensed curb and walk Contractor, performing work covered by these specifications under permit issued through the Department of Public Works, acting directly or through his agents or employees.
- k. *"Sub-Contractor"* Any other licensed curb and walk contractor to whom the contractor sublets or assigns any part or parts of the work covered by a permit, with the approval of the director.
- l. *"Curb"* The vertical edging of the paved portion of a street and installed in conformance with these specifications and accepted by the City for future maintenance.
- m. *"City Accepted Sidewalk"* Paved Laid Out walkway between curb and street line of five (5) inch thick Portland cement concrete or eight (8) inch thick reinforced Portland cement concrete (as hereinafter described under eight (8) inch walk) and constructed in conformance with these specifications, and accepted by the City for future maintenance.
- n. *"Non-City Accepted Sidewalk"* Paved walkway between curb and street line at driveways shall not be accepted for City maintenance and will remain the responsibility of abutting owner.
- o. *"City-Owned Sidewalk"* Paved walkway between curb and street line adjacent to City-owned property of five (5) inch thick or eight (8) inch thick reinforced Portland cement concrete and constructed in conformance with these specifications.
- p. *"Portland Cement Concrete Driveway Ramp"* Paved access way for vehicles from curb to back of sidewalk constructed of eight (8) inch thick reinforced Portland cement concrete and constructed in conformance with these specifications, and to remain the responsibility of the owner for future maintenance.

- q. *"Bituminous Concrete Driveway Ramps"* Paved access way for vehicles from curb to front edge of existing cement concrete sidewalks constructed of three (3) inch thick bituminous concrete and constructed in conformance with these specifications and to remain the responsibility of the owner for future maintenance.
- r. *"Eight-Inch Walk"* In such locations as may be determined by the Director, at all driveways and in business and industrial zones and non-conforming areas of residential zones, sidewalks constructed in accordance with City Standards shall be eight (8) inch thick reinforced Portland cement concrete, constructed in conformance with these specifications.
- s. *"Laid Out Walk"* The legally laid out sidewalk width and location with respect to the street line as recorded by the Bureau of Engineering Services.
- t. *"Paving Outside the Laid Out Walk"* With the approval of the Director, bituminous concrete or cement concrete paving may be constructed between the curb and laid out walk and back of the laid out walk to the street line. Two-inch bituminous concrete shall be constructed in accordance with these specifications. Cement concrete shall be of the same construction as the laid out walk and in accordance with these specifications and a longitudinal one-half (½) inch or expansion joint shall be placed adjacent to the laid out walk.
- u. *"Non-Accepted Construction"* Construction of curbing of any material other than granite or of laid out sidewalk of any material other than Portland cement concrete without written approval of the Director is not allowed.
- v. *"Areaways"* Any vault, cellar way or areaway or any cover, grating or door above the same within any street lines.
- w. *"Sidewalk Ramp"* A paved access way from the curb to or thorough the sidewalk.
- x. *"Authorized Representative"* An employee of the Contractor responsible to the Contractor for accepting written and oral orders on the job from the Director (or his representative) and with the authority to take action on said orders in the Contractor's absence.
- y. *"Roadway"* The paved portion of the street right-of-way between the curbs and/or the vehicular travel portion of the street right-of-way.
- z. *"Repair"* Shall mean work on a utility which restores the utility to its original working state without changing the character, location or size of the utility.
- aa. *"Clean Catch Basins"* All existing catch basins damaged or filled with sedimentation as a result of the construction process, shall be cleaned and flushed at the Contractor's expense.
- bb. *"Substantial Completion"* When construction is sufficiently complete, in accordance with the contract documents, so that the City of Hartford can occupy or utilize Street, or designated portion thereof, for the use for which it is intended. As a minimum the following items as applicable to the contract drawings or subsequent City authorized contract changes, are to be completed in their entirety to the satisfaction of the City of Hartford.
 -  Sidewalk and driveway work
 -  Curbing
 -  Utility/drainage work
 -  Pavement markings
 -  Loaming and seeding
 -  Pedestrian ramps
 -  Guide rail
 -  Paving

- cc. *"Final Completion"* When all contract items, including punch list items, and all City authorized changes, deletions, additions or revisions to the contract are completed in their entirety and accepted for payment by the City of Hartford.
- dd. *"Excavation"* A trench or any other opening of a surface dug for the purpose of performing work on the project site. This includes, but is not limited to, drainage trenches, openings for concrete sidewalks, sidewalks ramps, granite or concrete curbing, and driveway aprons.

3. **CONTRACTOR TO SUBMIT PLANS**

When so requested by the Engineer, the Contractor shall furnish the Engineer with plans or written statements of the methods which he proposes to use, which methods shall be subject to the approval of the Engineer before the work proceeds.

4. **CONTRACTOR TO SUBMIT SCHEDULE**

Before commencement of construction, the Contractor shall submit a written schedule showing starting dates and completion dates for each pay item on each street, outlining critical steps. The critical path method is the preferred format. This written schedule shall be submitted at the preconstruction conference if any and shall be revised and resubmitted at the beginning of each calendar month or as requested by the Engineer.

5. **REVIEW OF PAY QUANTITIES AND INVOICE**

The Contractor shall meet with the Inspector on a weekly basis for a review of the pay item quantities. Any discrepancies shall be resolved or quantities field measured at this time. The Contractor shall submit an invoice describing the items and quantity of work done, on a monthly basis. This invoice shall be approved by the Engineer before being processed for payment.

6. **WEIGHTS AND MEASUREMENT**

For each bid item, the Engineer will measure and pay for the actual quantities of materials installed on the finished job, except that, when the Contractor installs a greater quantity of a material than was ordered by the Engineer or than is determined to be necessary by the Engineer, the extra material will not be paid for. The Engineer may use truck delivery slips to compute quantity of material. The Engineer shall be furnished with a copy of each delivery slip showing the weights and/or the cubic measure of material in each delivery for materials so delivered.

7. **BASIS OF PAYMENT**

The basis of payment for each item shall be the unit price or lump sum price bid and listed on Exhibit A for each particular item. The price bid shall include all work listed in the item's specification and any other part of the Contract and all labor, material and equipment use incidental thereto. Measurement for payment of work done shall be as specified in WEIGHTS AND MEASUREMENT, Paragraph 6 above.

8. **CONTRACTOR'S RESPONSIBILITY**

- a. The Contractor shall be responsible for notifying the owner of any utility appurtenance he may encounter, above or below ground, that he may have damaged or that may require adjustment or relocation. The Contractor shall cooperate with the owner of said utility and schedule and conduct his work so as not to interfere with or hinder the completion of their work.
- b. The Contractor shall conduct the work at all times in such a manner as to insure the safety and least possible obstruction to traffic. The convenience and safety of the general public and of the residents along and adjacent to the street shall be provided for in an adequate and satisfactory manner. Materials stored within the street shall be placed so as to cause as little obstruction to the public as possible under the conditions. No street or section of the street shall be closed without written permission of the Director. The safety provisions of applicable laws, building and construction codes and safety codes approved by the State Labor Commissioner shall be observed. The Contractor shall provide sufficient suitable barricades to exclude and prevent injury to pedestrians, vehicles and animals. He shall also provide a sufficient number of red warning lights on or near the work from twilight in the evening until sunrise. If required by the Director, the Contractor shall provide and maintain temporary signs for the control of traffic and flag men or uniformed policemen to supplement traffic control.

9. **SANITARY CONVENIENCES**

Sanitary conveniences, properly secluded from public observation, shall be provided by the Contractor for the use of the laborers on the work site.

10. **DRINKING WATER**

Drinking water for the men on the job shall be provided by the contractor from an approved source, so piped or transported as to keep it safe and fresh. It shall be served in single service paper containers. Drinking water shall be furnished in strict accordance with existing health regulations.

11. **WORKERS**

The Contractor shall employ only competent, faithful and skilled persons to do the work required of them, and whenever the Engineer shall notify the Contractor that any person on the work site is, in his opinion, incompetent or unfaithful, such person shall be discharged from the work and shall not again be employed on it.

12. **WORK IN INCLEMENT WEATHER**

Whenever, in the opinion of the Engineer, weather conditions are such as to make impracticable the performance of satisfactory work under these specifications, he may designate such additional specifications as will, in his opinion, result in satisfactory work, or he may order the work suspended.

13. **PROTECTION OF THE WORK**

The Contractor shall protect all work done under this contract, and all work done by other contractors within the limits of this contract during the progress of the work and until completion, from injury by reason of any work under this contract, or by reason of any negligence on his part, or by reason of weather conditions. The method to be employed for protection shall be at the contractor's discretion, but shall be subject to the approval of the Engineer, who may order the work or any portion of it suspended when he considers conditions to be not favorable for first-class work.

The Contractor shall protect all work including but not limited to bituminous pavement, concrete walk, playground apparatus, grass areas, etc., from all traffic and use until it is suitable for use or until completion of the Contract.

14. **DUST CONTROL AND CLEANUP**

Upon suspension or completion of the work or of any section thereof, the Contractor shall remove all materials, equipment and rubbish, and shall leave the premises in a neat and orderly condition. The premises shall, during the progress of the work, be kept clean, presentable and satisfactory to the Engineer, and shall be so left at the completion of the Contract.

As the work progresses, all streets shall be thoroughly cleaned of all rubbish, excess earth, rock, and other debris. The Contractor shall take necessary precautions to prevent and avoid dust and to keep the streets clean each day. All clean up operations shall be accomplished at the expense of the Contractor and shall be carried out to the satisfaction of the Director of Public Works.

15. **MAINTENANCE**

The Contractor shall keep and maintain the constructed work in good repair for a period of one (1) year from the date the final payment is released by the City. This payment release is contingent on the timely receipt of the required final payment forms from the Contractor.

The Contractor must submit a written request to the City Engineer for a final inspection by the Engineer and the Engineer will make such inspection not more than seven (7) days after the date the City Engineer received the request.

It is agreed and understood that the Contractor will at any time during this one (1) year period, upon notification in writing from the City Engineer and without expense to the City, immediately execute all repairs which may be necessitated, as determined by the Engineer, by reason of any defective materials used therein, or by defective workmanship or by reason of the normal use or functioning of all facilities constructed under this contract.

16. **QUALITY OF MATERIALS/DEFECTIVE MATERIALS**

All work done and materials furnished shall be new and of the best quality customarily used in or furnished for installations of the character of that herein proposed. Many features of the proposed work are described in detail herein, but the failure to so describe any part of the proposed work or

any detail or appurtenance thereof shall not be an exception to the above rule. The absence of requirements in contract or specifications covering details usually included in first-class installations of this kind shall not excuse the Contractor for their omission in this work. All new material furnished on the project site must be accompanied by a batch slip or invoice, and a copy of this slip or invoice must be given to the job inspector.

The Engineer will reject any or all defective or damaged material or any material not, in his opinion, in conformity with the specifications.

Material which may at any time be rejected shall be set aside at a considerable distance from all acceptable material of like nature and, when ordered, shall be promptly removed. If the Contractor does not remove defective material promptly after written notice, the Engineer may cause such removal by such means as he shall select and at the Contractor's expense. All defective material shall be conspicuously marked by the Contractor. No defective or damaged material shall be used in the work.

17. **CERTIFIED TEST REPORTS, MATERIALS CERTIFICATE AND CERTIFICATE OF COMPLIANCE**

For such items and materials as the contract documents may specify, or the Engineer may designate, the Contractor shall furnish a Certified Test Report and Materials Certificate shall be forwarded to the job site.

These documents shall be forwarded to the Engineer; and in addition, a copy of the Certified Test Report and Materials Certificate shall be forwarded to the job site.

Materials requiring such documentation may be conditionally incorporated in the work prior to receipt of a Certified Test Report and a Materials Certificate; however, payment for such incorporated materials will not be made prior to receipt of the Certified Test Report and Materials Certificate which show that the material meets the requirements of the specifications.

If the reports and certificates show the material conditionally incorporated in the work does not meet the requirements of the specifications, such material shall be removed and replaced with material which does meet the requirements.

Final acceptance of the material shall be subject to the requirements of project approval and the issuance of a Certificate of Compliance.

A Certified Test Report is a document containing a list of the dimensional, chemical, metallurgical, electrical and physical results obtained from an actual test of the materials involved, and shall certify that the materials meet the requirements of the plans and specifications, and shall also include the following information:

- a. Item number and description of material
- b. Date of manufacture
- c. Date of testing
- d. Name of organization to which the material is consigned

- e. Quantity of material represented, such as batch, lot, group, etc.
- f. Means of identifying the consignment, such as label, marking, lot number, etc.
- g. Date and method of shipment
- h. Name of organization performing tests

The Certified Test Report shall be signed by an authorized and responsible agent for the organization manufacturing the material and it shall be notarized.

A Materials Certificate is a document certifying that the materials, components and equipment furnished, conform to all requirements of the plans and specifications. The document shall also include the following information:

- a. Project to which the material is consigned
- b. Name of Contractor to whom material is supplied
- c. Item number and description of material
- d. Quantity of material represented by the certificate
- e. Means of identifying the consignment, such as label, marking, lot numbers, etc.
- f. Date and method of shipment

The Materials Certificate shall be signed by an authorized and responsible agent for the organization supplying the material and it shall be notarized.

A Certificate of Compliance is a document certifying that the materials, components and equipment covered by the previously submitted Certified Test Report and Materials Certificate have been installed in the work and that they conform to all the requirements of the plans and specifications. The following information shall also be required on the document:

- a. Project number
- b. Item Number and description of material
- c. Quantity represented by the certificate
- d. Name of Manufacturer

The Certificate of Compliance shall be signed by an authorized and responsible agent for the Contractor and shall be notarized.

18. **CONSTRUCTION MATERIALS**

Construction materials on the site shall be limited in quantity and place occupying area so as to not hinder and block the use of the street, in accordance with the third paragraph of Section 40 of the General Requirements.

No advance payment will be made to the Contractor for construction materials purchased in advance and stored by the Contractor. All materials will be paid for each item complete and accepted in place according to the contract bid price.

19. **COORDINATION**

Coordination of plans, specifications, and special provisions; any requirement on the plans or in these specifications, the special conditions shall be equally binding on the Contractor.

In case of conflict, the order of governance among those requirements, in order of descending authority, shall be as follows:

1. Environmental Permits
2. Environmental Permit Applications
3. Special Provisions
4. Plans other than Standard Sheets (enlarged details on plans, used to clarify construction, shall take precedence over smaller details of the same area; and information contained in schedules or tables, titled as such, shall take precedence over other data on the plans)
5. Standard Sheets
6. Supplemental Specifications
7. Standard Specifications and other Contract Requirements

On all plans, the figure dimensions shall govern in case of discrepancy between the scales and figures. Neither party to the contract shall take advantage of any obvious error or omission in the Contract. The Engineer shall make such corrections and interpretations as may be deemed necessary for the completion of the work in a satisfactory and acceptable manner.

20. **DISCREPANCIES**

All discrepancies or items requiring further clarification shall be resolved through written communication to the Engineer.

21. **Construction Staking, Line, and Grade**

- a) The Contractors surveyor shall be responsible for supplying line and grade at least 48 hours prior to beginning any work that may require line and grade.
- b) The Contractor shall be responsible for transferring all line and grade from the offset line and establishing and maintaining string lines for grading and paving operations, both at the gutter line and the centerline of the road.
- c) The Contractor shall exercise extreme care not to damage, disturb or bury any City merestones which have been set at street corners or at angles in the street lines. The Contractor will furnish an appropriate form which shall be set in the sidewalk for the purpose of providing an opening for access to such merestones. A cover will be provided for such openings to be set flush with the sidewalk. It is the Contractor's responsibility to acquire merestone covers from the Commercial Foundry Company (New Britain Foundry) (860) 224-1794. If any merestones are disturbed, damaged or covered over, the Contractor will repair or remove and reset these merestones to the correct finished grade at his own expense.

- d) The Contractor shall complete all work to within 1/4 inch of line and grade as established by the Engineer, except where otherwise specified.

22. **LICENSING OF CURB AND WALK WORK AND STREET EXCAVATION WORK**

The Contractor must have a valid license issued for curb & walk construction and/or street excavation.

23. **PERMITS**

- a. A licensed Contractor who proposes to do any curb construction or repair, cement concrete walk or driveway construction or repair and/or street reconstruction or other miscellaneous work within the street shall first obtain a permit from the Department of Public Works Office at 50 Jennings Road.
- b. No work shall commence until the permit is on the job in the hands of the Contractor's authorized representative. The permit shall be on the job at all times work is being performed and shall be presented for inspection to the Director or the Engineer, their authorized representatives, or Inspectors assigned to the work, if so requested.

NOTE: The Contractor is cautioned that any work to be undertaken on State Highways, including intersection work to be completed adjacent City owned and maintained streets may require a permit from the Connecticut Department of Transportation. The Contractor is responsible to also secure any permit/approval from the Connecticut Department of Transportation, Bureau of Highways District office if required.

24. **TIME OF COMPLETION**

The Contractor shall complete all work contemplated by this Contract in a timely and orderly fashion as outlined in the Special Conditions section of this document, "SCHEDULING OF THE WORK." Approval to deviate from this schedule must be requested and obtained from the Engineer in writing.

The count of calendar days used will start on the day the Contractor begins work except that the count shall in no case start later than the tenth (10th) calendar day after the date of written notice to begin work.

The count may be interrupted by the Engineer if the Engineer determines it necessary to halt work on the entire job. The dates of stopping the count and resuming the count shall be specified to the Contractor in writing by the Engineer.

25. **WORK PROCEDURE**

Under this Contract, the Contractor will start and complete all paving on one section of the street at a time, scheduling his operations so that vehicular traffic will not be unduly hindered. Each section of paving shall be approved by the Engineer prior to beginning work.

The Contractor shall not excavate on more than two (2) streets at a time unless approved by the Engineer in writing. The Contractor shall notify homeowners 48 hours in advance when access to private property (e.g. driveways) is to be hindered or denied. Excavations for concrete sidewalks and sidewalk ramps shall not be open for more than 72 hours, at which time the Contractor shall complete this work or backfill the excavation completely, at no extra cost to the City.

Access to local properties shall be maintained at all times except when actual work is being done in front of a driveway to a property and except for the normal cooling period after the bituminous concrete has been laid.

26. **PROMPT COMPLETION OF WORK**

After an excavation is commenced, the Contractor shall prosecute with diligence and expedition work covered by the excavation permit and shall promptly complete such work and restore the street to its original condition or as near as may be, so as not to obstruct the street or travel thereon more than is reasonably necessary.

27. **WORK INTERRUPTIONS**

There may be some occasions where utility companies will be involved in the relocation of their existing facilities. The Contractor should be able to work in another location until the utility completes its work. No additional compensation will be made for delays or inconvenience sustained by him due to interference by the utility companies.

28. **TEMPORARY SUSPENSION OF WORK**

The Engineer shall have the authority to suspend the work wholly or in part, for such period or periods as he considers necessary in the best interest of the City, or in the interest of public necessity, convenience or safety.

If it should become necessary to stop work for an identified period, the Contractor shall store all materials and equipment in such manner that they will not obstruct or impede the traveling public unnecessarily nor allow the material to become damaged in anyway; and he shall take every precaution to prevent damage to the work already completed, and to erect temporary structures where necessary.

The Contractor shall maintain the roadway in safe condition for travel and shall maintain all barricades, signs and lights during the period of suspension; and the payment of the work shall be included in each of the appropriate bid items required.

29. **URGENT WORK**

If, in his judgment, traffic conditions, the safety or convenience of the traveling public or the public interest require that the excavation would be performed as emergency work, the Director of Public Works shall have full power to order that a crew of men and adequate facilities be employed by the Contractor up to 24 hours a day to the end that such excavation work may be completed as soon as possible.

30. **EMERGENCY ACTION**

Nothing in these rules shall be construed to prevent the making of such excavations as may be necessary for the preservation of life or property or for the location of trouble in conduit or pipe, or for making necessary repairs, provided that the person making such excavation shall apply to the Director of Public Works for such a permit on his first working day after such work is commenced.

The person engaged in emergency action shall notify the Department of Public Works, the Police Department, and the Fire Department at the start of the emergency work.

31. **MOBILIZATION AND DEMOBILIZATION**

The Contractor shall include mobilization and demobilization costs in the unit prices offered in the proposal. No separate payment shall be made for this work.

32. **INSPECTION OF THE WORK**

The Director of Public Works and/or his duly-authorized representatives shall be the judge of the character, nature and fitness of all the work done and all the material furnished; he shall decide as to the meaning, intent and performance of these specifications. The entire work shall be done under his supervision and to his satisfaction and his decisions upon all questions relating to said work shall be binding upon the Contractor.

33. **MANHOLES AND UTILITY CUTS**

All manhole frames and covers, gate boxes and similar structures in the area of the work will be reset to the proper line and grade by the Contractor or their respective owners. Repairs of all cuts in the pavement base will be the responsibility of the Contractor. The Contractor shall cooperate with all utility owners to facilitate this work.

34. **PAVING TOOLS**

The Contractor shall have sufficient hand tools and equipment in good operating condition, on the job and in use at all times that bituminous concrete binder and surface courses are being placed.

35. **SIGNS AND TRAFFIC DETOURS**

When necessary, the City will determine all traffic detours. The Contractor shall cooperate in placing the signs where ordered by the Engineer.

The Contractor shall place and maintain barricades as needed and as ordered by the City. He shall place barricades on all side streets at the next intersection away from the street being resurfaced. He shall place barricades where needed for City "Detour" and other such signs. Any barricades left at night must have lights and reflectors.

The Contractor shall furnish all warning signs as shown on the drawings as well as any and all additional barricades, traffic drums, detour signs and the like, including illumination of same as well as any obstacles in the roadway, using flares, battery powered flashers, or strings or electric light bulbs, as directed by the Engineer. All signs shall be in accordance with the Manual of Uniform Traffic Control Devices for Streets and Highways as published by the U.S. Department of Transportation, Federal Highway Administration, latest issue. Payment for said signs and traffic control devices shall be in accordance with the contract unit price shown in the Bid Proposal for each of the individual traffic signs and traffic control devices required.

36. **MAINTENANCE AND PROTECTION OF VEHICULAR AND PEDESTRIAN TRAFFIC**

The Chief of Transportation (Traffic Engineer) shall prescribe all conditions for maintenance and protection of traffic for each project. In general, if the excavation procedures expose utility frames for manholes, gate boxes, catch basins, etc. more than 2 inches, then a ramped section of processed stone or traffic control devices such as drums, cones and barricades shall be provided around these structures to prevent damage to vehicular traffic.

Ramped sections and traffic control devices shall be to such dimensions as shown in the contract drawings and at such locations as directed by the Engineer.

Equipment and material left within the street lines overnight shall be protected by barricades or traffic drums equipped with flashing lights, as directed by the Engineer, at the contractor's own expense. Failure to comply with this requirement will result in the revocation of the contractor's permission to stock material and equipment within the street lines overnight.

37. **NOISE**

Each Contractor shall conduct and carry out excavation work in such manner as to avoid unnecessary inconvenience and annoyance to the general public and occupants of neighboring property. During the hours of 10:00 p.m. and 7:00 a.m. he shall not use, except with the express written permission of the Director or in case of an emergency as herein otherwise provided, any tool, appliance or equipment producing noise of sufficient volume to disturb the sleep or repose of occupants of the neighboring property.

38. **OPERATION OF EQUIPMENT IN CITY STREET**

No equipment shall be operated with any metal surfaces, steel pads and cleats on backhoe outriggers and stabilizers and on crawler mounted equipment, etc., in direct contact with the surface of any pavement, curb or walk. The Contractor shall use suitable wood, plywood or rubber blocks under outriggers and stabilizers or shall use rubber or fiber pads manufactured for the purpose and fastened to the steel pads. Suitable planning shall be used under crawler mounted equipment.

All pavements, curbs and walks damaged by the Contractor during his operations and not scheduled for repair or replacement under this contract shall be repaired at the Contractor's own expense and without cost to the City.

39. **CLEARANCE OF VITAL STRUCTURES**

The excavation work shall be performed and conducted so as not to interfere with access to fire hydrants, fire stations, fire escapes, water gates, underground vaults, catch basins and all other vital equipment as designated by the Director of Public Works.

The Contractor shall maintain all gutters free and unobstructed for the full depth of the adjacent curb and for at least one (1') foot in width from the face of such curb at the gutter line. Catch basins shall be kept clear and serviceable.

The Contractor shall make provisions to take care of all surplus water, muck, silt, slickings, or other run-off pumped from excavations and shall be responsible for any damage resulting from his failure to so provide.

40. **RELOCATION AND PROTECTION OF UTILITIES**

Notice is hereby given that the Contractor must familiarize himself with applicable State Statutes regarding his duties and responsibilities with respect to excavating, discharging explosives on demolition in proximity to public utility underground facilities.

In case any said purpose pipe crossing or other encasement should be damaged, and for this purpose pipe crossing or other encasement or devices are to be considered as part of a substructure, they shall be repaired by the agency or person owning them and the expense of such repairs borne by the Contractor. The Contractor shall be responsible for any damage done to any public or private property by reason of the breaking of any water pipes, sewer, gas pipe, electric conduit or other utility. The Contractor shall inform itself as to the existence and location of all underground utilities prior to the commencement of excavation and protect the same against damage.

41. **PROTECTION OF ADJOINING PROPERTY**

The Contractor shall at all times and at his own expense preserve and protect from injury any adjoining property by providing proper foundations and taking other measures suitable for one purpose. The Contractor shall, at his own expense, shore up and protect all buildings, walls,

fences or other property likely to be damaged during the progress of the excavation work and shall be responsible for all damage to public or private property or highways resulting from its failure to properly protect and carry out said work. The Contractor shall not disturb, cut or remove (even temporarily) any trees, bushes, shrubs or flowers on City or private property. Any trees, bushes, shrubs or flowers which have been disturbed, removed or cut by the Contractor shall be the sole responsibility of the Contractor including replacement, should any of the trees, bushes, shrubs or flowers die as a result of the Contractor's work.

42. **EXCAVATION**

- a. **Curbs and Walks:** The term excavation as used in this contract for curbs and walks shall mean the removal to line and grade and the satisfactory disposal of all materials encountered, including the cutting and removal of tree roots, existing walk, driveways, curbs, gutters, and other obstructions as necessary to the preparation of the subgrade for all proposed improvements. All such material excavated during the course of the work and not reusable shall become the property of the Contractor and it shall be his responsibility to legally dispose of the material.

Excavations of curb shall be completely backfilled at the end of each workday. Excavations for sidewalks and sidewalk ramps shall not remain open for more than 72 hours, at which time the Contractor shall pour the concrete or completely backfill the excavation at no extra cost to the City.

- b. **Roadway and Driveway Ramps:** The excavation of roadways and driveway ramps shall conform to the first paragraph of (a) above. The excavation of roadways and driveway ramps must be completely backfilled and open for vehicular traffic at the end of each day.

43. **TRENCHES**

The maximum length of open trench permissible at any time shall be in accordance with existing ordinances or regulations or as may be specified by the City and no greater length shall be open for pavement removal, excavation, construction, backfilling, patching and all other operations without written permission of the City. The Contractor shall be required to backfill and protect all trenches before the close of any working day. However, at the discretion of the Engineer, the Contractor may utilize steel plates measuring approximately 1" thick by 5' wide by 10' long to cover the open trench. Utilization of steel plates will generally be used only for overnight protection of trenches to allow completion of work the following work day. Steel plates will not be used to keep trenches open more than one night. Trenches to be left open for more than one night will be backfilled.

44. **EXCAVATED MATERIAL**

All material excavated from trenches or excavations shall be removed from the site of the work except in rare cases where material is suitable for part of the backfill, however, permission must be granted by the Director prior to placement of any such material.

45. **DISPOSAL OF EXCAVATED MATERIAL**

Road grinding and excavated materials (Radius granite curbs, catch basin frames, etc.) that are reusable shall if, requested by the Engineer, be delivered to and unloaded at the location designated by the City, at no extra cost to the City. The delivery will be coordinated by the Engineer. All other materials excavated that are not reusable and not wanted by the City of Hartford shall become the property of the Contractor and it shall be his responsibility to legally dispose of the material.

46. **USE OF AREAS BEHIND CURB LINE**

The Contractor shall not store any material or park any equipment used on this contract behind the curb line or in the road, without written permission from the Engineer. Should any area back of curb become damaged during construction, the Contractor shall be responsible for restoring the area to its original condition as directed by the Engineer.

END OF SECTION

CITY OF HARTFORD STANDARD TECHNICAL SPECIFICATIONS

The latest revision of the City of Hartford's "Standard Technical Specifications for Streets and Roads, Traffic, and Streetscape Construction," are herein made part of this contract (Including Standard details). In this case "latest revision" is defined as the "Standard Technical Specifications for Streets and Roads, Traffic, and Streetscape Construction," in use by the City at the time this project was advertised. These Specifications and Details can be accessed at www.hartford.gov – Specifications and Manuals

END OF SECTION

**STATE OF CONNECTICUT, DEPARTMENT OF TRANSPORTATION, STANDARD
SPECIFICATION FOR ROADS, BRIDGES AND INCIDENTAL CONSTRUCTION, FORM
816**

The latest revision of the " State of Connecticut Standard Specification for Roads, Bridges, and incidental Construction (Form 816) are herein made part of this contract (Including Standard Details). Any references to 816, Article, or related nomenclature shall be meant to reference this document.

END OF SECTION

SPECIAL PROVISIONS OF SPECIFICATIONS

NOTICES TO CONTRACTOR

NOTICE TO CONTRACTOR – REFERENCES TO FORM 816 & 817

NOTICE TO CONTRACTOR – CONTRACTOR TRAINING REQUIREMENT FOR 10-HOUR OSHA
CONSTRUCTION SAFETY AND HEALTH COURSE

NOTICE TO CONTRACTOR – PRECONSTRUCTION DOCUMENTATION

NOTICE TO CONTRACTOR – VEHICLE EMISSIONS

NOTICE TO CONTRACTOR – EXISTING UTILITIES

NOTICE TO CONTRACTOR – ROAD CLOSURES

NOTICE TO CONTRACTOR – UTILITY SPECIFICATIONS

NOTICE TO CONTRACTOR – PERMITS AND PERMIT FEES

NOTICE TO CONTRACTOR – COORDINATION WITH OTHERS

NOTICE TO CONTRACTOR – LEGAL RELATIONS AND RESPONSIBILITIES

NOTICE TO CONTRACTOR – CONTROL OF THE WORK

NOTICE TO CONTRACTOR – PROSECUTION AND PROGRESS

NOTICE TO CONTRACTOR - PARKED VEHICLES

NOTICE TO CONTRACTOR – UTILITY NOTIFICATION AND GOLF COURSE OPERATIONS

NOTICE TO CONTRACTOR – LIMITED STOCKPILES AND LAYDOWN AREAS

NOTICE TO CONTRACTOR - SUBSTITUTIONS

NOTICE TO CONTRACTOR - USE OF FORM 816 AND 817

The Contractor shall substitute all references to Form 816 and 817 to mean “State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 818, 2018”, including all applicable supplemental specifications.

NOTICE TO CONTRACTOR – CONTRACTOR TRAINING REQUIREMENT FOR 10-HOUR OSHA CONSTRUCTION SAFETY AND HEALTH COURSE

In accordance with Connecticut General Statute 31-53b and Public Act No. 08-83, the Contractor is required to furnish proof that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53, has completed a course of at least ten hours in duration in construction safety and health approved by the Federal Occupational Safety and Health Administration or, has completed a new miner training program approved by the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268.

Proof of compliance with the provisions of the statute shall consist of a student course completion card issued by the federal Occupational Safety and Health Administration, or other such proof as deemed appropriate by the Commissioner of the Connecticut Department of Labor, dated no earlier than five years prior to the commencement of the project. Each employer shall affix a copy of the construction safety course completion card for each applicable employee to the first certified payroll submitted to the Department of Transportation on which the employee's name first appears.

Any employee required to complete a construction safety and health course as required that has not completed the course, shall have a maximum of fourteen (14) days to complete the course. If the employee has not been brought into compliance, they shall be removed from the project until such time as they have completed the required training.

This section does not apply to employees of public service companies, as defined in section 16-1 of the 2008 supplement to the General Statutes, or drivers of commercial motor vehicles driving the vehicle on the public works project and delivering or picking up cargo from public works projects provided they perform no labor relating to the project other than the loading and unloading of their cargo.

The internet website for the federal Occupational Safety and Health Training Institute is <http://www.osha.gov/fso/ote/training/edcenters>.

Additional information regarding this statute can be found at the Connecticut Department of Labor website, <http://www.ctdol.state.ct.us/wgwkstnd/wgemenu.htm>.

Any costs associated with this notice shall be included in the general cost of the contract. In addition, there shall be no time granted to the contractor for compliance with this notice. The contractor's compliance with this notice and any associated regulations shall not be grounds for claims as outlined in Section 1.11 – "Claims".

NOTICE TO CONTRACTOR – PRE-CONSTRUCTION DOCUMENTATION

The Contractor is hereby notified and advised that as a condition of this project he shall provide pre-construction documentation of the project site. Ground photography shall consist of color video taping of surface features taken along the entire length of the project and including all work and storage areas and all intersecting roadways. Prior to audio-video taping of the project, all areas to be inventoried shall be investigated visually with notations made of items not readily visible by taping methods.

The Contractor shall submit the following for approval in accordance with Conditions of Contract: Video equipment specifications

A. Pre-Construction Recording

Prior to the delivery of any equipment, materials or supplies to the site of any work, or to the beginning of any of the construction work, the Contractor shall provide pre-construction photography as specified herein for the purpose of establishing the surface conditions existing in all of the areas to be affected by the construction.

Purpose of Video Taping: The purpose of the color audio-video taping of the project is to provide the necessary information for restoration of surface features after completion of the project. The Contractor shall be responsible for repairing any damage or defect not documented as existing prior to construction.

B. Video Photography

Coverage of Taping: Such coverage shall include, but not be limited to, all existing driveways, sidewalks, curbs, streets, signs, landscaping, trees, catch basins, fences, visible utilities and all buildings located within the zone of influence. Of particular concern are any existing faults, fractures, defects or other features. Audio description shall be made simultaneously with and support the video coverage.

Streets – shall be recorded by audio-video tape for the full width of the right-of-way, except where specifically noted otherwise by the City Engineer.

Work Agreement Areas – shall be recorded by audio-video DVD including all adjacent areas lying within the zone of influence of construction as directed by the City Engineer. The size and locations of all areas to be taped will be shown on the Plans or otherwise supplied by the City Engineer.

Front and/or Side Yard Areas – of residential homes within the zone of influence of construction shall be recorded.

C. Equipment

Video – Color audio-video shall be DVD format.

D. Location Information

All DVD's shall be properly identified by number, location and project name in a manner acceptable to the City of Hartford.

A record of the contents of each DVD shall be supplied on a run sheet identifying each segment in the tape by location, i.e., street viewing side, traveling direction, engineering stationing, and all referenced by tape counter numbers.

All video recordings shall begin with the date and time of recording, the project name, the sheet numbers of engineering stationing as shown on the plans, the name of the street, area or building being taped, the direction of travel and the viewing side. Houses and buildings shall be identified visually by house or building address, when possible, in such manner that the progress of the taping and the proposed system may be located by reference to the houses and buildings.

E. Entering Private Property

If it becomes necessary to enter onto private property, notify the owner of such property at least 24 hours in advance of the planned entry to obtain his permission to do so. Should the owner of the property refuse to give his permission for said entry, notify the City Engineer.

The contractor is advised that he shall not enter any private property before permission is granted to do so, or the City Engineer notified by the Contractor that he has gained the legal right to do so. The Contractor shall be held liable for entry made other than stated herein.

F. Ownership of Recordings

All DVD's produced will become the permanent property of the City of Hartford. The Contractor shall deliver all tapes to the City of Hartford prior to the beginning of any construction work.

Any portion of the DVD coverage deemed unacceptable by the City Engineer must be re-taped by the Contractor at no additional charge to the City of Hartford.

G. Site Recording Conditions

All taping shall be done during times of good visibility. No outside taping shall be done during periods of visible precipitation or when the ground area is covered with snow, leaves or debris, unless otherwise authorized by the City Engineer.

In order to produce the proper detail and perspective, adequate auxiliary lighting will be required to fill in shadow areas caused by trees, utility poles, road signs and other such objects, as well as other conditions requiring artificial illumination.

The average rate of speed in the general direction of travel of the conveyance used during taping shall not exceed 60 feet per minute. Planning rates and zoom-out rates shall be controlled sufficiently so that playback will produce adequate clarity of the object being viewed.

When conventional wheeled vehicles are used as conveyances for the taping, the distance from the camera lens to the ground shall be such as to ensure proper perspective. In instances where tape coverage will be required in areas not accessible to conventional wheeled vehicles, such coverage shall be obtained by walking or by special conveyance approved by the City Engineer but with the same requirements for tape quality and content as specified herein, except as may be specifically exempted by the City Engineer.

NOTICE TO CONTRACTOR - VEHICLE EMISSIONS

All motor vehicles and/or construction equipment (both on-highway and non-road) shall comply with all pertinent State and Federal regulations relative to exhaust emission controls and safety.

The contractor shall establish staging zones for vehicles that are waiting to load or unload at the contract area. Such zones shall be located where the emissions from the vehicles will have minimum impact on abutters and the general public.

Idling of delivery and/or dump trucks, or other equipment shall not be permitted during periods of non-active use, and it should be limited to three minutes in accordance with the Regulations of Connecticut State Agencies Section 22a-174-18(b)(3)(c):

No mobile source engine shall be allowed “to operate for more than three (3) consecutive minutes when the mobile source is not in motion, except as follows:

- (i) When a mobile source is forced to remain motionless because of traffic conditions or mechanical difficulties over which the operator has no control,
- (ii) When it is necessary to operate defrosting, heating or cooling equipment to ensure the safety or health of the driver or passengers,
- (iii) When it is necessary to operate auxiliary equipment that is located in or on the mobile source to accomplish the intended use of the mobile source,
- (iv) To bring the mobile source to the manufacturer’s recommended operating temperature,
- (v) When the outdoor temperature is below twenty degrees Fahrenheit (20 degrees F),
- (vi) When the mobile source is undergoing maintenance that requires such mobile source be operated for more than three (3) consecutive minutes, or
- (vii) When a mobile source is in queue to be inspected by U.S. military personnel prior to gaining access to a U.S. military installation.”

All work shall be conducted to ensure that no harmful effects are caused to adjacent sensitive receptors. Sensitive receptors include but are not limited to hospitals, schools, daycare facilities, elderly housing and convalescent facilities. Engine exhaust shall be located away from fresh air intakes, air conditioners, and windows.

A Vehicle Emissions Mitigation plan will be required for areas where extensive work will be performed in close proximity (less than 50 feet (15 meters)) to sensitive receptors. No work will proceed until a sequence of construction and a Vehicle Emissions Mitigation plan is submitted in writing to the Engineer for review and all comments are addressed prior to the commencement of any extensive construction work in close proximity (less than 50 feet (15 meters)) to sensitive receptors. The mitigation plan must address the control of vehicle emissions from all vehicles and construction equipment.

If any equipment is found to be in non-compliance with this specification, the contractor will be issued a Notice of Non-Compliance and given a 24 hour period in which to bring the equipment into compliance or remove it from the project. If the contractor then does not comply, the Engineer shall withhold all payments for the work performed on any item(s) on which the non-conforming equipment was utilized for the time period in which the equipment was out of compliance.

Any costs associated with this "Vehicle Emissions" notice shall be included in the general cost of the contract. In addition, there shall be no time granted to the contractor for compliance with this notice. The contractor's compliance with this notice and any associated regulations shall not be grounds for claims as outlined in Section 1.11 – "Claims".

NOTICE TO CONTRACTOR - EXISTING UTILITIES

Existing utilities shall be maintained during construction. The Contractor shall verify the location of underground, structure mounted, and overhead utilities. Construction work within the vicinity of utilities shall be performed in accordance with current safety regulations.

The Contractor shall notify “Call Before You Dig,” telephone: 1-800-922-4455, for the location of public utilities, in accordance with Section 16-345 of the Regulations of the Department of Utility Control.

The Contractor shall be required to dig test pits as shown on the drawings or as ordered by the Engineer. The Contractor shall report the results of the test pits to the Engineer immediately. The Contractor's attention is called to NTC Utility Generated Schedule for additional information with regard to utilities.

Contractors are cautioned that it is their responsibility to verify locations, conditions, and field dimensions of all existing features, as actual conditions may differ from the information shown on the plans or contained elsewhere in the specifications.

Also, refer to “Section 1.07 - Legal Relations and Responsibility to the Public.”

NOTICE TO CONTRACTOR - ROAD CLOSURE

The Contractor will not be allowed to close any roads during the prosecution of work on this contract unless specifically indicated otherwise on the plans or in the specifications. Traffic detours as shown on the plans and contained within the contract documents shall be established. All roads within the project limits shall be open to minimum two-way traffic during and after work hours. Detours shall not be allowed unless approved by the City in advance of proposed work.

The Contractor shall notify the City of Hartford, CT Transit, BOE Transportation, and emergency service providers that will be affected by any detour at least two weeks prior to initiating the detour.

NOTICE TO CONTRACTOR - UTILITY SPECIFICATIONS

The Contractor is hereby notified that all utility specifications contained elsewhere herein shall be made a part of this contract, and that the contractor shall be bound to comply with all requirements of such specifications. The requirements and conditions set forth in the subject specifications shall be binding on the Contractor just as any other specification would be.

NOTICE TO THE CONTRACTOR - PERMITS AND PERMIT FEES

It is the Contractor's responsibility to obtain and pay for all required Federal, State, City and Utility permits applicable to this project.

SECTION 1.05 - CONTROL OF THE WORK

Article 1.05.02 - Plans, Working Drawings and Shop Drawings is supplemented as follows:

Subarticle 1.05.02 - (2) is supplemented by the following:

Goodwin Park Improvements:

When required by the contract documents or when ordered by the Engineer, The Contractor shall prepare and submit product data sheets, working drawings and/or shop drawings for materials to the City of Hartford for approval before fabrication. The packaged set of product data sheets, working drawings and/or shop drawings shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf). The package submitted in paper form shall include one (1) set. Product data sheets shall be printed on ANSI A (8 ½" x 11"; 216 mm x 279mm; letter) sheets. Working drawings and shop drawings shall be printed on ANSI B (11" x 17"; 279 mm x 432 mm; ledger/tabloid) sheets.

Please mail to:

Keith Rapoza
Engineering Division
City of Hartford
50 Jennings Road
Hartford, Connecticut 06106
(860) 757-9984

The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file with appropriate bookmarks for each item. The electronic files for product data sheets shall be created on ANSI A (8 ½" x 11"; 216 mm x 279mm; letter) sheets. Working drawings and shop drawings shall be created on ANSI B (11" x 17"; 279 mm x 432 mm; ledger/tabloid) sheets.

Please send the pdf documents via email to:

rapok001@hartford.gov

NOTICE TO THE CONTRACTOR - COORDINATION WITH OTHERS

The Contractor is hereby notified and advised that construction operations by other contractor(s) and or utilities may occur within and/or in close proximity to the project limits identified on the plans for this project. The construction phasing has been developed to minimize interference in operations between contractors and utilities however, it is expected that in some cases the work of other contractors or utilities may overlap and/or occur simultaneously to the operation(s) conducted under this project.

The Contractor shall coordinate his work with the work of others in such a manner that allows for construction to proceed in an expeditious manner in accordance with the contract plans and as directed by the Engineer. Some delays and/or rescheduling of work can be expected during the prosecution of work as a result of coordination with others. No claim for additional compensation will be allowed for the work required to or that results from work to coordinate with others.

SECTION 1.07 - LEGAL RELATIONS AND RESPONSIBILITIES

Article 1.07.13 - Contractor's Responsibility for Adjacent Property, Facilities and Services is supplemented as follows:

The following company and representative shall be contacted by the Contractor to coordinate the protection of their utilities on this project 30 days prior to the start of any work on this project involving their utilities:

Comcast of Connecticut
222 New Park Drive
Berlin, CT 06037
Mr. Gary Meek
(860) 505-3331
Gary-meek@cable.comcast.com

Frontier Communications
1441 North Colony Road
Meriden, CT 06450-1979
Mr. Joseph Areso Jr., Dir. Of Comm.
(203) 238-2640
Jaa603@ftr.com
Mr. David St. Martin, Area Mgr.
David.w.stmartin@ftr.com

Metropolitan District
555 Main Street
Hartford, CT 06142
Mr. Richard Norris, PE
(860) 278-7850
RNorris@themdc.com

City of Hartford, (Alarm & Signal)
275 Pearl Street
Hartford, CT 06103
Mr. Christopher Henry
(860) 761-4286

Keith Rapoza
City of Hartford, Engineering
50 Jennings Road
Hartford, CT 06120
(860) 757-9984
Rapok001@hartford.gov

City of Hartford, Police
253 High Street
Hartford, CT 06103
Lt. Christopher Mefferd
(860) 757-4411

Eversource Energy
410 Sheldon Street
Hartford, CT 06103
Mr. Donald Holmes
(860) 280-2443
Donald.K.Holmes@eversource.com
Mr. Robert Ferguson
Robert/ferguson@eversource.com
Mr. Jarmarlo Love
(860) 280-2445
LoveJw@eversource.com

Connecticut Natural Gas
76 Meadow Street
East Hartford, CT 06108
Mr. Martin Ritter
(860) 727-3358
MRitter@ctgcorp.com

Hartford Steam Boiler
60 Columbus Boulevard
Hartford, CT 06103
Mr. James Elsner
(860) 548-7346
JElsner@hartfordsteam.com

CT Transit
100 Liebert Road
P.O. Box 66
Hartford, CT 06141-0066
Mr. Charlie Carson, Dir. Of Scheduling
(860) 522-8101 ext. 216
ccarson@cttransit.com

MEFFC001@hartford.gov

Comcast of Connecticut
Mr. Jim Bitzas
Sr. Manager of Western New England
1110 East Mountain Road
Westfield Ma 01085
Phone 413 562 9923 Ext. 5783252
Cell 617 279 7485
Jim_bitzas@cable.comcast.com

Yankee Gas Service Company
Energy Gas
Mr. Thomas Costa
Manager Gas Project engineering
157 Cordaville Rd.

Frontier Communications
Ms. Lynne De Lucia
Manager-Engineering & Construction
1441 North Colony Road
Meriden, CT. 06450-4101
203-238-5000
Cell 860-967-4389

The following representative shall be contacted by the Contractor to coordinate an inspection of the service entrance into the service cabinet, and transformer for the Booster Pump Assembly when ready for inspection, release, and connection of electrical service.

Mr. Nelson J. Blanco
Eversource
Hartford, CT 06103
860-757-4582
Nelson.blanco@eversource.com

Please provide the electrical service request number provided by the power company. This is a Work Request (WR) Number provided by Eversource (formerly Northeast Utilities [CL&P]) or a Work Order Number provided by United Illuminating (UI).

NOTICE TO CONTRACTOR - SECTION 1.08 - PROSECUTION AND PROGRESS

Article 1.08.04 - Limitation of Operations - Add the following:

Restrictions

The Contractor will not be allowed to perform any work that will interfere with play on more than 2 holes within the course at any given time.

Allowable Work Periods

The Contractor shall be allowed to work on the project between 7:00AM and 5:00PM Monday thru Friday. Work will not be allowed after 5:00PM unless authorized by the Engineer. Work shall not be performed on Weekends or Holidays unless authorized in advance by the Engineer.

Irrigation Construction

During the allowable period, the Contractor install a reasonable length of work in such a manner that no open excavations or trenches shall remain open at night. Work shall be conducted in an organized manner to minimize disruption to Golf Course Operations. The Contractor shall coordinate with and make provisions with the course operators to ensure access to existing buildings when work occurs at an entrance. The contractor may be required to provide temporary surfaces, and/or ramps. If these items are required, no additional payment will be made, and the cost of such work shall be considered as part of this items.

All temporary connections to abutting driveways and existing roads, sidewalks and paths must be completed in a satisfactory manner prior to the end of the workday/night. Excavation and installation of all conduit and repairs to walking and cart paths must be completed and backfilled at the full width of the path. Opening trenches and excavations will not be permitted over-night. Steel plates shall only be used in an emergency. No payment will be made to the contractor for the use of steel plates.

Other Requirements

The field installation of a signs indicating that a hole has been temporarily taken out play shall be placed as appropriate during work hours and removed at the close of each day's work.

Construction Staking

The Contractor shall establish grades and control points in accordance with the plans and as ordered by the Engineer. This work will not be paid for separately but shall be included in the cost of the work.

NOTICE TO CONTRACTOR – PARKED VEHICLES

The Contractor is hereby notified that parked vehicles may be present within the limit(s) of work. The Contractor shall place No Parking signs and be responsible to coordinate and work with the Police Department and property owners to facilitate the work. The Contractor may be required to schedule his operations to minimize impact(s) to parking within certain locations. No additional compensation will be made for this work and all costs shall be included in the overall cost of the work.

**NOTICE TO CONTRACTOR – UTILITY NOTIFICATION AND COORDINATION
WITH GOLF OPERATIONS**

The Contractor is required to coordinate and notify all utilities and Golf Course operators of his proposed scheduling and construction activities. The Contractor shall conduct his operations in such a manner that no more than 2 holes are interfered with at any given time. The Contractor is advised that golf operations shall remain active during the course of work and that the project schedule should account for possible float time during operations and be in compliance with the project requirements.

After award, the Contractor shall conduct a coordination meeting or meetings to obtain contemporaneous scheduling information from the Goodwin Park Golf Course Operations Manager prior to submitting its baseline schedule to the City in accordance with the requirements of the Contract.

The Contractor shall incorporate the contemporaneous scheduling information into its baseline schedule submittal. The baseline schedule shall include Contractor predecessor and successor activities to the work in such detail as acceptable to the Engineer.

After the baseline schedule has been approved, the Contractor will be required to attend bi-weekly meetings to provide a status update of work completed and a 2 week look ahead.

Th Goodwin Park Golf Course Operations Managers for this project are:

Mr. Matt Guilmette
Mr. Christopher Guilmette
Guilmette Golf, LLC
guilmettegolfllc@gmail.com
860-798-5308

NOTICE TO CONTRACTOR – LIMITED STOCKPILES AND LAYDOWN AREAS

The Contractor may choose to utilize stockpile and laydown areas as shown on the plans. The areas shall be kept clean, organized, and safe. The City reserves the right to use any portion of these areas for its own purpose at any time.

The stockpile and laydown area located in the parking area adjacent to the Goodwin Park Pond House will not be available for the Contractors use from October 31st to March 30th. All materials shall be removed during this time period and the area returned to its original condition.

NOTICE TO CONTRACTOR – SUBSTITUTIONS

The Contractor is required to provide the specific products, materials and use the specified vendors where required by the contract special provisions unless the term “Or Approved Equal” is specified and the City of Hartford has approved the product, material, or vendor in advance of receiving bids.

DIVISION 01 GENERAL REQUIREMENTS

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END OF SECTION 01-0000

SECTION 01-1000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Related Documents
2. Summary
3. Project information.
4. Work covered by Contract Documents.
5. Work under separate contracts.
6. Definitions
7. Time of Completion.
8. Documents required before execution of the Contract.
9. Access to site and use of the Site.
10. Coordination with occupants.
11. Work restrictions.
12. Prohibited Items
13. Work Sequence.
14. Miscellaneous provisions.

B. Related Requirements:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Division 01 Section "Temporary Tree and Planting Protection" for general protection and pruning of existing trees and plants that are affected by the execution of the Work.
3. Division 01 Section "Submittal Procedures" for submittal requirements prior to start of work.

1.3 PROJECT INFORMATION

A. Project Identification: Goodwin Park Irrigation & Booster Pump Improvements

1. Project Location: 1130 Maple Ave, Hartford, CT 06114

B. Owner: **City of Hartford**

Owner's Representative: Keith Rapoza Engineering Division
 City of Hartford 50 Jennings Road Hartford, Connecticut 06106
 (860) 757-9984; rapok001@hartford.gov

C. Engineer: **BETA Group Inc.**
Jay Bertoli, LEED AP
1010 Wethersfield Ave # 305,
Hartford, CT 06114
T: 860.513.1503
JBertoli@BETA-Inc.com

1. Engineer's Consultants: The Engineer has retained the following design professionals who have prepared designated portions of the Contract Documents:
 - a. Electrical Engineer
Dean Azzam, PE – President
Wethersfield Ave, Hartford, Ct 06114
Phone: (860) 548-9987, Ext 21 direct: (860) 785-6755

1.4 WORK COVERED BY CONTRACT DOCUMENTS

The Work of Project is defined by the Contract Documents and consists of the following:

1. The entire scope of work is delineated in the Drawings & Specifications attached hereto and includes in part; Set up and maintain site security & pedestrian detours. Dust control. Set up and maintain entry gate tracking pad(s) and maintenance of city streets, parking lots & sidewalks in proximity of the site access point(s). Coordinate with the Goodwin Park DPW for the maintenance & protection of traffic and citizens in the vicinity of the site. Set up and maintain erosion controls. Removal, screening, trucking offsite and legal disposal of soils, also including construction debris from site clearing, the debris generated from demolishing of site improvement structures at the indicated onsite areas for removals and new installations. Removals, cleaning, repairs and modifications to the existing drainage systems, as well as furnish & installation of structures for the new irrigation system. Backfill with suitable materials, compaction and grading to required elevations. Furnish & install pump station and precast concrete building, Furnish & install broom finished concrete pavements. Furnish & install HMA pavement. Furnish & install landscape curbing. Furnish and install rain garden. Furnish & install site elements as indicated on the Plans. Furnish and installation of a new power system. Furnish & install landscaping improvements. Removal of all debris caused by this Contract.
2. Protection of the public, building, grounds from damage during this contract is the responsibility of the Contractor for this project at all times.
3. Repair or replace landscaping including trees, shrubs or other planting disturbed during the Work of the contract with new to match existing, unless otherwise noted. Regrade and reseed any grass area damaged as a result of the Work. Repair any walkways or paved areas damaged as a result of the Work.

1.5 DEFINITIONS UNDER THE CONTRACT DOCUMENTS

- A. Engineer: The term used to designate the Professional Consultant who contracts with the Owner or Design Builder to provide, Engineering, Interior Design, Commissioning services for the

Project. The Engineer is a separate consultant and not an agent of the Owner. The term includes any associates or sub-consultants employed or contracted by the Engineer/Engineer to assist in providing the overall services. Such position shall be implied that they are the Engineer/Engineer of record.

- B. Contract Documents: The Contract between Owner and Contractor signed by the Owner and the Contractor and any documents expressly incorporated therein for the Project. Such incorporated documents customarily include the Contract and General Conditions, any Supplemental General Conditions, any Special Conditions, the plans and the specifications, and all modifications, including addenda and subsequent Change Orders.
- C. Contractor: The person or entity with whom the Owner has directly entered into a contractual agreement to do the Work. Applies to Construction Manager, General Contractor or Prime Contractor.

Companies that are owned or operated by the same individual or entity, close relations, parent company or subsidiary, who operate under the same address and/or building, has either directly or indirectly any degree of ownership, management or control of another corporation, company or partnership; has directly or indirectly close relations or family members, share the same or adjacent space addresses or share resources to perform work as a joint venture formally or informally; is viewed as a signatory employer and not as separate trade supplier or installers who subcontracts and/or supply to each other. Such entities are viewed as a single pooled resource and therefore not separate unto each other.

- D. Day: Means a calendar day, 24-hour period. All response times and schedules shall be based on a calendar day, unless specifically noted otherwise.
- E. Daily Construction Report: A written daily log recording the day's construction site activities conditions and progress.
- F. Daily Additional Work Tickets: Recording the day's trade labor work performed for a change in the work issued by a CCD.
- G. Drawing: A page or sheet of the Plan which presents a graphic representation, usually drawn to scale, showing the technical information, design, location, and dimensions of various elements of the Work. The graphic representations include, but are not limited to, plan views, elevations, transverse and longitudinal sections, large and small scale sections and details, isometrics, diagrams, schedules, tables and/or pictures.
- H. Like New Condition: The appearance of looking new having no marks, chips, or cracks.
- I. Notice to Proceed: A written notice given by the Owner to the Contractor (with a copy to A/E) fixing the date on which the Contract time will commence for the Contractor to begin the prosecution of the Work in accordance with the requirements of the Contract Documents. The Notice to Proceed will customarily identify a Contract Completion Date.
- J. Owner: City of Hartford.
- K. Project: The term used instead of the specific or proper assigned title of the entire undertaking which includes, but is not limited to, the "Work" described by the Contract Documents.

- L. **Project Manager:** The Project Manager as used herein shall be the Owner's designated representative on the Project. The Project Manager shall be the person through whom the Owner generally conveys decisions. The Owner may change the Project Manager from time to time or may appoint an interim Project Manager.
- M. **Site:** Shall mean the location at which the Work is performed or is to be performed. Also referred to as Work Zone, Site Logistics Plan, and Construction Area.
- N. **Specifications:** That part of the Contract Documents containing the written administrative requirements and the technical descriptions of materials, equipment, construction systems, standards, and workmanship which describe the proposed Work in sufficient detail and provide sufficient information for the Contractor to perform the Work.
- O. **Subcontractor:** A person or entity having a direct or indirect contract with the Contractor for the performance of the Work. Subcontractor includes any person or entity who provides on-site labor but does not include any person or entity who only furnishes or supplies materials for the Project.

A person or entity that provides and installs product received from a wholesaler or distributor and not directly from the manufacturer/fabricator/producer, are viewed as a Dealer. Dealer entities are recognized as Subcontractors and shall follow the same requirements under the contractor documents. Dealers shall disclose their net costs for materials and equipment from where they purchase their materials.

A person or entity that has either directly or indirectly any degree of ownership, management or control of another corporation, company or partnership; directly or indirectly with family members, share the same or adjacent space addresses or share resources to perform work as a joint venture formally or informally; is viewed as a signatory employer. Such circumstances shall be viewed as a single entity and not as sub-tiers or separate supplier and installer. Where the contract documents refer to the "Contractor", the requirements under the contract shall also apply to the Subcontractor.

- P. **Submittals:** All shop, fabrication, setting and installation drawings, diagrams, illustrations, schedules, samples, and other data required by the Contract Documents which are specifically prepared by or for the Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by the Contractor to illustrate material or equipment conformance of some portion of the Work with the requirements of the Contract Documents.
- Q. **Substantial Completion:** The entire work shall not be limited to physical construction. The Work for Substantial Completion shall include aspects of general conditions and general requirements.
- R. **Supplier:** A manufacturer, fabricator, wholesaler or distributor, who provides material for the Project but does not provide on-site labor. A subcontractor or sub-tier subcontractor cannot be also a material supplier. See definition of Subcontractor which addresses Dealers.
- S. **Traffic Control:** A person who is appropriately trained and certified to provide traffic control flagging services. On any State roads, traffic control shall be performed by Police.

- T. Work: The services performed under this Contract including, but not limited to, furnishing labor, and furnishing and incorporating materials and equipment into the construction. The Work also includes the entire completed construction, or the various separately identifiable parts thereof, required to be furnished under the Contract Documents.

1.6 ACCESS TO THE SITE AND USE OF THE SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
1. Limits: Confine construction operations to areas within the Project limits indicated in the contract documents. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
 - a. Changes to the location of the identified perimeter contract limits, including access to the project site shall not be assumed by the Contractor. Contractor must submit a detailed narrative to the Engineer and Owner on impacts to constructability as to why the contracted Project limits cannot be maintained.
 - b. Restore all lawn, sidewalk, paved areas damaged by vehicles and or construction activities to their original or better condition. See Section on Temporary Facilities and Controls for more details.
 - c. All grounds including construction site within contract limit shall be kept neat and orderly at all times.
 2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, other contractors and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 3. Burial of Waste Materials: Do not dispose of organic and hazardous material on site, either by burial or by burning.
 4. Construction Entrances:

Contractor shall prevent sediment from being transported onto paved areas and roads by construction vehicles exiting the project site. Contractor shall be responsible for immediate clean-up of soils or sediments tracked onto paved off site areas including but not limited to sweeping with motorized sweepers and power washing paved areas as required.

 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 5. Condition of Existing Building:

Maintain portions of existing building affected by construction operations in a weather tight condition throughout construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

6. Condition of existing perimeter Buildings and Landscape:
Protect surrounding buildings from noise, dust/dirt and pollution caused by the construction of the project. Take all precaution necessary to protect the surrounding space and maintain controls.

Refer to Section 01-3300 Part 2.1.L Safety Plan for submittal requirements prior to site access

Refer to Section 01-5000 Temporary Facilities and Controls for additional requirements

Refer to Section 01-5719 Temporary Environmental Controls for additional requirements

1.7 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations, the use of public streets and with other requirements of authorities having jurisdiction.
 1. Work shall adhere to the Owner's noise limits.
 - a. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 4:30 p.m., Monday through Friday, unless otherwise indicated. Permission must be requested and approved in writing prior to performance of the work outside the normal working hours or on a State Holiday.

Refer to Section 5719 Temporary Environmental Controls for other acceptable noise levels during working hours.

2. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - a. Obtain Owner Representative written permission before proceeding with utility interruptions.
3. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - a. Notify Owner Representative not less than two days in advance of proposed disruptive operations.
 - b. Obtain Owner's written permission before proceeding with disruptive operations
 - c. Noise which exceeds 55 db at the site perimeter will not be permitted between the hours of 8:00 PM and 8:00 AM.
4. Deviations: Contractor shall not assume deviations to the noise restrictions.
 - a. Deviation is dependent upon availability of supervisory personnel.
 - b. Certain aspects of the project, may require work to be performed off hours outside of the requirements the Contractor or Owner determines that work on this project must be performed during a time other than normal working hours of the owner, costs for any premium time must be included in the Base Bid.

1.8 WORK SEQUENCE

The responsibility of phasing the Work falls entirely on the Contractor.

1.9 MISCELLANEOUS PROVISIONS

1. Certifications

- a. The Contractor, at completion of construction, shall provide to the Owner a "Certificate of Substantial Compliance" bearing original signatures of an officer of the company stating: "this is to CERTIFY that, in my professional opinion, the complete structure/renovations described above is in substantial compliance with the approved construction documents on file with the City of Hartford. Minor deviations and special stipulations are noted below (if any)"
- b. The Contractor shall provide licensed and/or specific certification(s) of subcontractors who self-perform the work. Contractor shall provide a list of suppliers and all subcontractors and sub-tier subcontractors that have performed work on the project under the contract. Refer to submittal and close out provisions for additional requirements.

2. Owner Supplied Documents

Original construction drawings are provided for information and reference only and do not represent exact conditions existing in the buildings. The Contractor is responsible for all work described in the scope of work regardless of information provided in the reference drawings. This information is offered in good faith for information only, solely for the purpose of placing the Contractor in receipt of all information known to the City at this time. Unless otherwise provided, this data is not to be considered a part of the contract documents. The City does not warrant or represent that the information contained in these reports is complete or accurate but only that it constitutes a disclosure of the information known to the Owner at this time regarding these conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01-1000

SECTION 01-2100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Value Allowance:
An amount established in the Contract Documents for inclusion in the Contract Sum to cover the cost of prescribed items not specified in detail, and as shown in the Allowance Schedule.
 - 2. Quantity Allowances.
An amount which is attributable to a discrete quantity to be carried. Unit costs applicable to a quantity allowance shall be used for values associated.
- C. Related Requirements:
 - 1. Division 01 Section "Unit Prices" for procedures for using unit prices.
 - 2. Divisions 02 through 33 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

- A. Within the initial submitted CPM schedule, reflect the dates when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work. Such dates shall represent what the supplier's lead time for delivery of product through its installation and commissioning (where applicable).
- B. At Engineer's request, obtain proposals for each allowance for use in making final selections, include recommendations that are relevant to performing the Work.
- C. Purchase products and systems specified by the Engineer.

1.4 SUBMITTALS

- A. Labor hours shall have pre-approved hourly rates. Failure of the Contractor to obtain pre-approved hourly rates prior to use of the allowance, shall not relieve the Contractor from reconciliation of the allowance upon final receipt of approved labor rates. Adjustments to the previous use shall be made accordingly.
- B. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- C. Submit invoices or delivery/weigh slips to show actual quantities of materials delivered to or removed from the site for use in fulfillment of each allowance.
- D. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- E. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 UNUSED MATERIALS

- A. Return unused materials to the manufacturer or supplier for credit to the Owner, after installation has been completed and accepted.
- B. Where it is not economically feasible to return unused material for credit and when requested by the Owner, prepare unused material for the Owner's storage, and deliver to the Owner's storage space as directed. Otherwise, disposal of excess material is the Contractor's responsibility.

1.6 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as may be required to coordinate installation.

1.7 ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Engineer under allowance and shall include freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit and similar costs related to products and materials under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.8 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Proposed Change Order based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
 5. Remaining balance values in an allowance cannot be used to compensate overages in another allowance without prior written change management document approval from the Owner.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.9 ALLOWANCE CLOSE OUT

- A. Any unused portion of the allowance, whether it is value allowance or quantity allowance, shall be credited to the Owner. Any unused portion of the allowance shall be reviewed by the owner to determine the amount of credit, based on actual invoices, delivery slips, etc.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No.1: Value-Cost Allowance: Include the sum of **\$100,000** for Owner's Contingency of the BASE BID
- B. Allowance No.1: Value-Cost Allowance: Include the sum of **\$25,000** for Owner's Contingency of the ADD ALTERNATE #1
- C. Allowance No.1: Value-Cost Allowance: Include the sum of **\$25,000** for Owner's Contingency of the ADD ALTERNATE #2
- D. Allowance No.1: Value-Cost Allowance: Include the sum of **\$25,000** for Owner's Contingency of the ADD ALTERNATE #3

Coordinate allowance adjustment with unit-price requirements in Division 01- Section "Unit Prices".

END OF SECTION 01-2100

SECTION 01-2200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
 - 1. A unit price is an amount stated on the Proposal Form or in the Specifications as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the quantities of Work required by the Contract Documents are increased or decreased. Should the number of units anticipated substantially increase by more than ten (10) percent, such unit price shall be renegotiated.
 - 2. Upon request, provide a complete breakdown upon request of how the unit price was calculated. Unit Prices include all necessary material, delivery, equipment and manpower, overhead and profit, and applicable taxes.
 - 3. Refer to individual Specification Sections for construction activities requiring the establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- B. Related Requirements:
 - 1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Division 01 Section "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. For adjustment of the Contract Sum, track and provide supporting documentation (delivery or removal/disposal tickets) as deemed necessary to confirm Unit quantities provided or removed. Such quantities shall be tracked against any specific "Allowance" line item which may be included within the base contract value. Contractor must report status of Unit Price Allowances regularly and not exceed such allowance value without prior authorization from the Owner. Unit Price that does not have an allowance applied to it shall be treated with a CCD until all quantities have been determined. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor. Should it be determined that the work measured by the independent surveyor is five (5) or more percent less than the Contractor's reported measurement, Contractor shall be responsible for the cost associated with the independent survey and adjustment to the measurement.
- C. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price No. 1: Rock excavation and replacement with satisfactory soil material.
 - 1. Description: Classified rock excavation and disposal off site and replacement with satisfactory fill material or engineered fill from off site, as required, according to Division 31 Section 23 00 EXCAVATION AND FILL".
 - 2. Unit of Measurement: Cubic yard of rock excavated, based on survey of volume removed.
 - 3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Division 01 Section "Allowances."

END OF SECTION 01-2200

SECTION 01-3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Informational Submittals
2. General coordination procedures.
3. Coordination drawings.
4. Requests for Information (RFIs).
5. Project Meetings.
 - a. Pre-construction conference
 - b. Pre-installation conference
 - c. Progress meetings
 - d. Coordination meetings
 - e. Landscape Status Updates
6. General Administration

- B. Related Requirements:

1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's CPM construction schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Key Personnel: Provide at the pre-construction meeting a list of key personnel assignments, including project manager, superintendent, safety engineer and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list business addresses and telephone numbers, including office, and cellular telephone numbers and e-mail addresses.

Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Keep list current and available at all times.
 2. The Owner requires as a minimum, the following Key Personnel be assigned to this project. Each position shall be with an individual knowledgeable in the work that they will be providing under this contract and who is employed full-time under the Contractor, dedicated to the position listed.
 - a. Project Manager (on site a minimum of once a week for duration of the project through closeout)
 - b. Project Superintendent (on-site full time for duration of the project through closeout)
 3. Each individual listed above shall have not less than five (5) years' experience performing work of a similar nature to this project and in a comparable position to the position assigned on this project. Resumes will be required on all key personnel prior to acceptance by the Owner. Any Contractor personnel denoted as Key Personnel that were previously accepted by the Owner, shall not be removed from the project without Owner's prior approval.
- B. See section on submittals for more required submittals for approval.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. At a minimum, weekly inspections of project by the safety officer are required. Safety inspector reports shall be made available at the Owner's request within 24 hours.
 3. Inspections of the project by the official(s) having jurisdiction at intervals required by the respective general permit requirements. Regardless as to who applied for a permit, the Contractor is responsible to comply and perform all requirements associated with any permit issued against the Project.
 - a. Operating permit
 - b. Health and Safety permit
 - c. Environmental permit(s)
 4. The Contractor is responsible to abide by the terms of all Environmental Permit requirements including but not limited to:
 - a. Flood Management Permit (when applicable)
 - b. Construction Stormwater General Permit (when applicable)
 - c. Inland Wetlands and Water Resource Permit (when applicable)
 - i. Turbidity testing and reporting
 - d. New Source Review permit (when applicable)

- e. Waste Water Discharge permit (when applicable)
 - f. Environmental Title V Air permit (when applicable)
5. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 6. Coordinate demolition of different components to ensure maximum performance and safety.
 - a. Upon immediate demolition, cap the ends of the pipes to contain the off gases coming from within the pipe to eliminate potential false gas leak reports and ensure safety to other areas not being impacted.
 7. Make adequate provisions to accommodate items scheduled for later installation.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities required by the Contractor include, but are not limited to, the following:
1. Submission of Contractor's CPM construction schedule
 2. Preparation of the schedule of values
 3. Approval of required submittals
 4. Purchase of equipment and material, long lead items
 5. Installation and removal of temporary facilities and controls
 6. Listing, delivery and processing of submittals.
 7. Documentation, circulation and acceptance of all Project meetings
 8. Documentation, circulation and acceptance of all Progress meetings
 9. Project closeout activities
 10. Startup and adjustment of systems
- C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: **PRIOR TO START OF WORK ACTIVITY:** Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data or Engineers electronic data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

- b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
2. Coordination Drawings Review: Engineer will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Engineer determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Engineer will so inform Contractor, who shall make changes as directed and resubmit.
- a. Contractor shall not rely on the availability of BIM for use in Contractor's coordination.

1.7 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified and sent directly to the Engineer.
1. Engineer will return RFIs submitted to Engineer by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 3. Habitual submissions of RFI's not having any serious purpose and/or having no sound basis and/or is consistently incomplete and/or is already answered within the Contract documents, the Contractor shall reimburse the Owner for the Engineer's additional time reviewing and answering such RFIs.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of the Contractor.
 5. Name of the person requesting clarification.
 6. Name of Engineer.
 7. Name of the person responding to the RFI

8. RFI number, numbered sequentially.
 9. RFI subject.
 10. Specification Section number and title and related paragraphs, as appropriate.
 11. Drawing number and detail references, as appropriate.
 12. Field dimensions and conditions, as appropriate.
 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 14. Contractor's signature.
 15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716 or similar and in a form acceptable to the Owner and Engineer
1. Attachments shall be electronic files in Adobe Pro PDF format.
- D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven (7) days for Engineer's response for each RFI. RFIs received by Engineer after 3:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Engineer's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.
 3. Engineer's action on RFIs is not intended to change the Contract Time or the Contract Sum.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer and Owner in writing within seven (7) days of receipt of the RFI response with a proposed order of magnitude cost.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly or as directed in a format **acceptable to the Engineer and Owner**. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Engineer.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.

6. Date the RFI was submitted.
 7. Date Engineer's response was received.
- F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven (7) days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work.
 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

- A. Preconstruction Conference: The successful bidder shall attend a preconstruction conference and organizational meeting at the Owner's Office of Planning, Architectural and Engineering Services, with the Owner prior to any field work to review responsibilities and personnel assignments and to insure that Specifications, drawings and all conditions are understood to properly complete this Contract.
1. The meeting will be scheduled by the Owner's Representative.
 2. Attendees: The Owner, authorities having jurisdiction, Environmental Health and Safety Representative, Parking Services Representative, Environmental Compliance representative, , Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties may attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including but not limited to the following where applicable:
 - a. List of Submittals initially required, see 3300 submittal procedures.
 - i. Review each to ensure that they have been submitted for review and acceptance.
 - b. Items for discussion or review not limited to:
 - i. Contractor's CPM Construction schedule.
 - ii. Phasing.
 - iii. Logistics Plan review.
 - iv. Critical work sequencing and long-lead items.
 - v. Labor Market Regulations.
 - vi. Designation of key personnel and their duties.
 - vii. Lines of communications and emergency phone numbers.
 - viii. Procedures for processing field decisions and potential Change Orders.
 - ix. Procedures for RFIs.
 - x. Procedures for testing and inspecting.
 - xi. Procedures for processing Applications for Payment.
 - xii. Distribution of the Contract Documents and correspondence.
 - xiii. Submittal procedures.
 - xiv. Preparation of record documents.
 - xv. Use of the premises, including dust and noise control.
 - xvi. Work restrictions including working hours.

- xvii. Owner's occupancy requirements.
 - xviii. Responsibility for temporary facilities and controls.
 - xix. Procedures for disruptions and shutdowns.
 - xx. Construction waste management and recycling.
 - xxi. Office, work, and storage areas.
 - xxii. Equipment deliveries and priorities.
 - xxiii. Security.
 - xxiv. Progress cleaning.
 - xxv. Owner's Contractor Environmental Health and Safety Manual, Safety procedures, including the Owner's Hazard Communication Program and policies on pest control, asbestos, lead-based paints, lockout/tagout procedures, excavation and trenching, disposal of PCB containing light ballasts, use of solvents, solvent or epoxy based paints, confined space entries and use of open flames.
4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- B. Project Meeting: The Contractor shall schedule and conduct meetings and conferences at Project site unless otherwise indicated. Project Meetings shall at a minimum be performed bi-weekly.
- 1. Attendees: Coordinate with the Owner and Engineer a set day and time for the project meetings. Identify in collaboration with the Owner and Engineer any other key individuals whose presence is required. This meeting is not intended to be inclusive with any Pre-installation Conference or Progress Meeting requirements. List all required attendees.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees at least two working days prior to the scheduled meeting. Discuss items of significance that could affect progress, including but not limited to the following:
 - a. Review of the previous meeting minutes. Record corrections and any agreements/disagreements
 - b. Progress of the work.
 - c. Compare construction progress with the Project's approved CPM Construction Schedule.
 - i. Review progress since the last meeting.
 - ii. Identify activities on the critical path that are ahead of schedule, or behind schedule, in relation to the contractually accepted construction schedule.
 - iii. Provide recovery steps on how construction behind schedule will be brought back into schedule.
 - iv. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - d. Review Contractor's site safety reports.
 - e. Review any critical work sequencing and long-lead items.
 - f. Review of any management or supervisory responsibilities:
 - i. Contractor conduct
 - ii. Unacceptable behavior of any worker
 - iii. Staffing / Man Power.
 - iv. Protection of construction personnel and adjacent sites.
 - v. Dust and noise control.
 - vi. Progress cleaning.
 - vii. Temporary facilities and controls.

- viii. Construction waste management and recycling.
 - ix. Security
 - x. Hazard Communication Program
 - g. Review of Submittal log.
 - h. Review of RFI log.
 - i. Review of proposed change order (PCO) log.
 - j. Review of Change Order log.
 - k. Review any Payment issues.
 - l. Review the next two weeks look ahead schedule.
 - i. Identify any testing and inspections to be performed.
 - ii. Any work restrictions including working hours.
 - iii. Scheduling of disruptions and shutdowns
 - iv. Equipment deliveries and priorities.
 - m. Review any other critical issues.
 - 3. Minutes: Entity responsible for conducting meeting will clearly identify themselves as the author of the minutes, record and distribute meeting minutes. The meeting will record significant discussions and agreements achieved. With each meeting held, minutes shall reflect the author, all invited attendees, any additional attendees who attended the meeting and those invited attendees that did not attend the meeting. Distribute the meeting minutes to everyone concerned for review, including but not limited to Owner and Engineer, within three (3) days of the meeting.
 - 4. Minutes from the previous meeting shall be reviewed at the start of each subsequent meeting. Document any clarifications, corrections, or exceptions to the contents of the minutes and identify the attendee requesting the adjustments. Resolve any disagreements that may arise with the contents and document accordingly and document within the minutes. Minutes shall not require acceptance prior to the next scheduled meeting, unless the project has reached final completion and final payment is in process.
- C. Pre-installation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer, and Owner of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including but not limited to requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals, shop drawings, product data, and quality control samples.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.

- k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Safety.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.
 - v. Commissioning
 - w. Installation procedures.
 - x. Coordination with other work.
 - y. Required performance results.
 - z. Protection of adjacent work.
 - aa. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Entity responsible for conducting meeting will record and distribute meeting minutes. Meeting minutes shall identify who the author is and date the meeting was held. Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings with Contractor's subcontractors at the Project Site at regularly (minimum bi-weekly) scheduled intervals. Contractor shall:
- 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Review and correct or accept minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's CPM Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction activities behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - i. Review schedule for next period.

- b. Review present and future needs of each entity present, including but not limited to the following:
 - i. Interface requirements.
 - ii. Sequence of operations.
 - iii. Status of submittals.
 - iv. Deliveries.
 - v. Off-site fabrication problems.
 - vi. Access.
 - vii. Site utilization.
 - viii. Temporary facilities and controls.
 - ix. Progress cleaning.
 - x. Quality and work standards.
 - xi. Status of correction of deficient items.
 - xii. Field observations.
 - xiii. Status of RFIs.
 - xiv. Status of proposal requests.
 - xv. Pending changes.
 - xvi. Status of Change Orders.
 - xvii. Pending claims and disputes.
 - xviii. Documentation of information for payment requests.
 - xix. Safety and Subcontractor Conduct on the site.

- 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information. Meeting minutes shall identify who the author is and the date the meeting was held. Contractor shall distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report. Submit report no later than 3 days after each progress meeting date.
 - a. Schedule Updating: Revise Contractor's CPM Construction Schedule after each progress meeting where revisions to the schedule to recover have been discussed. Issue revised schedule concurrently with the report of each meeting.

- E. Coordination Meetings: Conduct Project coordination meetings at regular intervals convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 - 1. Attendees: Every party currently involved in coordination or planning for the construction activities involved. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting. Meeting minutes shall identify who the author is and the date the meeting was held.

- F. Landscape Status Updates: Contractor shall require and receive regular written status updates from his landscape sub-contractor(s) on portions of the work the subcontractor is performing. Contractor shall distribute status updates to the Owner.

1.9 GENERAL ADMINISTRATION

- A. Call Before You Dig (CBYD): Contractor is responsible to monitor the conditions of the markings and maintain their appearance throughout the duration necessary to complete the work associated with the markings. At the time of Substantial Completion, the Contractor is responsible for the complete removal of all CBYD markings required for the project that is applied to any hard surface.
- B. GIS Surveying: Contractor is responsible for documenting field conditions and new installation using coordinates mapping, in cases of subsurface material installation, such mapping shall include depth to the top of the material, size and characteristics of the material and distance adjacencies to other subsurface identified material, active or inactive that is exposed. Contractor is responsible for ensuring that any flags or markings used in establishing the mapping are removed at the completion of the survey work for the day. Contractor shall immediately have removed any flags or markings that are no longer needed.
- C. Contractor shall comply to the requirements outlined within CGS Sec. 4e-70 relating to confidential information,
- D. Contractor and Subcontractor Information:
 - 1. Before the first application for payment, provide a list of all known Contractors, Subcontractors and Suppliers who are intended to be working on or supplying material and equipment to the project for review and acceptance by the Owner.
 - a. Identify if the business is a nonresident business, are they verified or unverified by the State of Connecticut Department of Revenue Services pursuant to Conn. Gen. Stat. §12-430 and follow all requirements associated.
 - b. Such list shall be updated and resubmitted with each month's application for payment pencil draft.
- E. Application for Payment Procedures:
 - 1. Contractor shall submit for review within 30 days of contract signing, a project specific schedule of values for payment. Schedule of values are to represent at a minimum the following (as applicable) and shall have a value associated with each element:
 - a. General Conditions:
 - i. Bond Costs (actual)
 - ii. Project and Administrative Management
 - iii. Supervisory and Daily Site Record keeping
 - iv. Safety Management
 - v. Site Trailer and associated general site operational expenses
 - vi. Temporary Fencing – Site Logistics
 - vii. Security Management
 - viii. Coordination Documents – assigned value shall be no less than 25 % of total general conditions value. Payment shall be made based on full complete coordination of systems within the documents.
 - ix. Closeout Documents – assigned value shall be no less than 30 % of total general conditions value.
 - b. List of CSI Division sections identified within the contract documents, broken down by:
 - i. Labor
 - ii. Material
 - iii. Equipment (large value pieces and/or systems)

- iv. If the project requires work to be performed in phases, breakdown by phase and then by General Conditions and by CSI Divisions.
 - v. If the project work entails multiple floors/stories, breakdown by floor and then by CSI Divisions.
 - c. List only those Change Orders that have been fully executed by all parties.
 - i. Include with the CO listing within the Schedule of Values, any CCD that was issued in support of the Change Order. Example: CO 3 / CCD 2 Insulation of water line Gamble.
 - d. Do not list alone PCO's or CCD's within the schedule of values.
 - e. Only those change orders that have been fully executed by all parties shall be listed and allowed to be a part of the month's billing. Should the Contractor list a change order prior to full execution and receipt back, regardless if the application has been certified by the Engineer, the Owner shall not be responsible for any delays in payment and shall have the right to reject the application and ask for a resubmission with removal of any change orders as deemed warranted.
2. Attachments to the Application for Payment for processing:
- a. Pencil Draft
 - i. Copy of email sent to designated email address submitting report and payroll in support of previous months' work.
 - ii. Copy of certified summary cover sheet Worker Distribution Report.
 - iii. Subcontractor list updated in the format required by the Owner.
 - b. First Application for payment
 - i. List of all Subcontractors and Suppliers who will be providing or performing work under the contract in the format outlined by the Owner.
 - ii. Formal submission to the Owner for review and approval, Contractor and subcontractors (where applicable) list of company owned equipment in the format outlined in Section 2600 Contract Modifications.
 - iii. Formal submission to the Owner for review and approval, Contractor, subcontractor and sub-tiers Labor Rates.
 - iv. Equipment Rates: Contractor shall submit for review and approval by the Owner an hourly, weekly and monthly rate for each self-owned piece of equipment. Such rates shall not exceed the rate reflected in Equipment Watch. The list of equipment shall provide the following information:
 - a) Type of Equipment
 - b) Year
 - c) Make
 - d) Model
 - e) Size / Capacity
 - f) Registration #
- F. Certified Payroll: Pursuant to CGS Sec. 31-53, original certified payrolls with a statement of compliance shall be submitted.
- 1. On a monthly basis, all certified payrolls for the project shall be received from their subcontractors by the Contractor. The Contractor is responsible to track, monitor and report for compliance with the Department of Labor and Owner requirements.

- a. Documents are to be submitted in the format acceptable to the Connecticut Department of Labor.
 - b. Verify all certified payrolls are being received from all subcontractors and sub-tier subcontractors performing work on the project for the period of time being reported.
 - c. Confirm payroll information has been included not limited to paycheck number.
 - d. Ensure each payroll reporting is filled out completely even if the worker is the “owner” of the company performing the work. Reporting as “Owner” performance with no payment information is not in conformance with CTDOL requirements.
 - e. Verify that the Subcontractor has a current compliant Connecticut Worker’s Compensation policy.
 - i. Obtain the subcontractor’s workers compensation policy premium sheet.
 - ii. Policies that state “Interstate” do not meet the statutory requirements.
 - f. Verify the appropriate Agent for the Subcontractor submitting the payroll has certified each reporting week.
 - g. Obtain and verify current OSHA 10 certifications for any all workers who performed on the project. Include a copy of each workers OSHA 10 certification, when first reporting them on certified payrolls.
 - h. Ensure all certified payrolls for the month have been received for work performed by the various subcontractors and sub-tiers, inclusive of all weeks within the month worked and not worked.
 - i. Ensure that the last required submission of certified payrolls are identified as the “Final” submission.
 - j. Utilize the Worker Geographic Report data template and record each weekly Certified Payroll submission from each subcontractor for work performed or not under the project for that particular week. Record alphabetically.
2. Contractor shall submit all certified payrolls (including their own) and supporting documents to the Owner in the following manner:
- a. Submit electronically to: **TBD**
 - b. Submit monthly at the same time as when the pencil draft of the application for payment is submitted for approval.
 - c. Provide in the Subject line of the email the following information in the order represented:
 - i. Project #
 - ii. Contractor Name
 - iii. Period Reporting On

Example: Goodwin April 2022 Certified Payrolls
 - d. Organize the documents in the following manner prior to uploading the document into the email:
 - i. Contractor’s Worker Geographic Distribution Report
 - ii. Contractor’s certified payrolls with each week of the month in sequential order;
 - iii. Subcontractors certified payrolls organized alphabetically by subcontractor and then within each subcontractor submission, by each sequential week of the month being reported;
 - iv. Ensure that each side of a payroll page (if double sided) has been scanned to include their certification for that payroll reporting;
 - v. In the body of the email, identify any non-compliance issues relating to the payrolls being reported on to the Owner.

3. Failure to consistently submit complete complying certified payrolls to the Owner in the format outlined, any costs incurred by the Owner to perform the requirements, shall be a reimbursement from the Contractor to the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01-3100

SECTION 01-3200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 1. Contractor's Project Milestone Construction schedule.
 2. Contractor's CPM schedule
 3. Construction CPM schedule updating reports.
 4. Daily construction reports.
 5. Material location reports.
 6. Site condition reports.
 7. Special reports.
 8. GIS Mapping of existing and new conditions
- B. Related Requirements:
 1. Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.
 2. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 3. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 2. Predecessor Activity: An activity that precedes another activity in the network.
 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Owner.
- C. Milestone: An action or event marking a significant stage or stages in the life of a construction project. Significant milestones may include but not limited to (where applicable):

1. Projected start date. Provide sufficient time for the Owner and Contractor to execute the contract.
 2. Pre-Construction Meeting
 3. Critical and non-critical Submittal submissions and approvals (provide sufficient time for reviews as outlined in the contract)
 - a. Pre-functional checklist of equipment submittals, as a part of commissioning
 4. Mobilization with temporary fencing system and project signage installation.
 5. Construction start date
 6. Site work start date
 7. Demolition start date
 8. Demolition completion date
 9. Site work completion date
 10. Utilities upgrades start date (each)
 11. Utilities shutdown / tie-ins (each)
 12. Utilities upgrades completion date (each)
 13. Structural Foundations start date
 14. Structural Foundations completion date
 15. Field completion of functional equipment / Submission of Statement of preparedness
 16. Substantial Completion
 17. Final Completion
- D. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- E. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- F. Event: The starting or ending point of an activity.
1. Float: The measure of leeway in starting and completing an activity. The excess time included in a construction schedule to accommodate such items as severe unusual inclement weather and associated delays, equipment failures, and other such unscheduled events. It is the contingency time associated with a path or chain of activities and represents the amount of time by which the early finish date of an activity may be delayed without impacting the critical path and delaying the overall completion of the Project. Any difference in time between the Contractors' approved early completion date and the Contract Completion Date shall be considered a part of the Project float. Float time belongs to the Owner. Free Float: The time (in days) by which an activity may be delayed or lengthened without adversely impacting upon the early start day of any activity following in the chain.
 2. Total Float: The difference (in days) between the maximum time available within which to perform an activity and the duration of an activity. It represents the time by which an activity may be delayed or lengthened without impacting the Time for Completion or the Contract Completion Date.
 3. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Contractor's CPM Construction Schedule shall be submitted within 14 days of contract execution and notice to proceed or at the time of the pre-construction meeting whichever comes first. Should Contractor fail to submit a project specific CPM construction schedule within time table outlined, costs associated for an independent third party scheduler hired by the Engineer to establish and maintain for the duration of the project will be borne by the Contractor. Contractor shall provide input and adhere to the established CPM construction schedule.
- B. Format for Submittals: Submit required schedule submittals in the following format:
1. Working electronic copy of construction schedule file, as indicated.
 2. Acceptable software:
 - a. Microsoft office for small uncomplicated projects as determined by the Owner.
 - b. Primavera 6 for large more complicated projects as determined by the Owner
 3. Format submission
 - a. PDF (ADOBE PRO) electronic file.
- C. Contractor's Project Milestone Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
1. Milestone schedule shall be submitted upon receipt of Letter of Intent as a condition to award and shall be in a size required to display a readable schedule for entire construction period. Document page size shall not exceed 8.5x11 and is not limited to a single page.
 2. Submit an electronic copy of schedule, using software acceptable to the Owner, and labeled to comply with requirements for submittals.
 3. Contractually accepted Contractor's Project Milestone Construction schedule shall not be altered from what was initially accepted. Contractor's Project Milestone Construction schedule can only be adjusted by fully executed change order.
- D. Contractor's CPM Schedule: Subsequent schedule that details all activities associated with the work. The Contractor's CPM schedule represents the Contractor's plan for achieving the contractual completion of the project. Updates to and the submission of the Contractor's CPM schedule shall not represent acceptance by the Owner and/or Engineer.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 3. Total Float Report: List of all activities sorted in ascending order of total float.
 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
 5. Resource Loading Report: List all activities initial resource loadings as compared to actual for the month.
- F. CPM Construction Schedule Updating Reports: Submit with each Applications for Payment.
- G. Daily Construction Reports: Submit at monthly application for payment intervals.

- H. Material Location Reports: Submit at monthly application for payment intervals.
- I. Geographic Distribution Reports: Submit at monthly application for payment intervals.
- J. Site Condition Reports: Submit at time of discovery of differing conditions.
- K. Special Reports: Submit at time of unusual event.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate Owner's contractors and/or Contractor's subcontractors.
- B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to the date required for Substantial Completion.
 - 1. Anticipated Notice to Proceed date: For purposes in establishing the start date of the project schedule, represent the start date as an additional seven (7) days beyond the time allotted within the letter of intent for required documents to be submitted by the Contractor to the Owner for contract execution. Should the time anticipated for the project start date be exceeded due to Contractor's failure to provide accurate timely documents and/or availability to fully execute the contract, Contractor shall not be entitled to an extension to the date outlined for Substantial Completion. Should the time anticipated for the project start date be exceeded due to Owner's failure to provide accurate timely documents and/or availability to fully execute the contract, the Contractor shall be entitled to an extension to the date outlined for Substantial Completion equal to the days taken by the Owner to issue a Notice to Proceed. Such extension shall not be compensable.
 - 2. Substantial Completion date shall not be changed for reasons not caused by the Owner. Should the time allotted within the letter of intent for contract required documents to be submitted by the Contractor, be exceeded due to Contractor's failure to provide such accurate timely documents within the time frame identified the Contractor shall not be entitled to an extension to the date outlined for Substantial Completion.
 - 3. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Revise "Activity Duration" Subparagraph below to suit Project. Long activity durations provide less detail and, therefore, less information with which to manage a project. As an alternative to specifying activity duration, indicate minimum and maximum number of activities, which will result in a similar effect.
 2. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by the Owner.
 3. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than sixty (60) days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 4. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 5. Startup and Testing Time: Include no fewer than fifteen (15) days for startup and testing.
 6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow a minimum of fifteen (15) days for Engineer's administrative procedures necessary for Punch List and certification of Substantial Completion.
 7. Punch List and Final Completion: Include not more than thirty (30) days for completion of punch list items and final completion.
- C. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Utility interruptions, Substantial Completion, and Final Completion.
- D. Two Week Look ahead schedule: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
- E. Recovery Schedule: When periodic update indicates the Work is behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance and date by which recovery will be accomplished.
- F. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. CPM Schedule: Prepare Contractor's construction schedule of sufficient detail to indicate all significant construction activities. The level of detail should be such that no activity should exceed twenty (20) days. Where similar activities continue beyond the twenty (20) day limit,

these activities should be broken into subgroups, specific areas, or phases so that the twenty (20) day maximum duration is maintained.

1. Develop network diagram in sufficient time to submit CPM schedule for review no later than fourteen (14) days after date established of contract execution.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Owner's approval of the schedule.
 2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 3. Subparagraph below coordinates between working days of time and calendar days. Under AIA Document A201, the Contract Time is in calendar days.
 4. Use "one calendar day" as the unit of time for individual activities. Indicate nonworking days, restricted days as outlined in Section 01-1000 Summary and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- B. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Date of Notice to Proceed
 - b. Preparation and processing of submittals.
 - c. Mobilization and demobilization.
 - d. Purchase of materials.
 - e. Delivery.
 - f. Fabrication.
 - g. Utility interruptions.
 - h. Installation.
 - i. Special Equipment
 - j. Testing.
 - k. Commissioning
 - l. Telecommunications installations
 - m. Furniture installations (where applicable) and Owner installations
 - n. Punch list and final completion.
 - o. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. Day of the week, date and the time of day the report is filled out.
 2. List of subcontractors at Project site.
 3. List of separate contractors at Project site.
 4. Approximate count of personnel by subcontractor and trade labor work being performed at Project site.
 5. Separately document any and all change order work being performed, the subcontractor/contractor performing and number of personnel. Obtain and confirm work performed, manpower trade category and hours worked against additional work tickets of the subcontractor or Contractor.
 6. Construction equipment at Project site.
 7. Material deliveries and confirmation receipts of quantities delivered.
 8. Materials and Equipment not yet incorporated into the work yet stored at the Project site.
 9. High and low temperatures and general weather conditions, including presence of rain or snow.
 10. Accidents.
 11. Meetings and significant decisions.
 12. Unusual events (see special reports).
 13. Stoppages, delays, shortages, and losses.
 14. Meter readings and similar recordings.
 15. Emergency procedures.
 16. Orders and requests of authorities having jurisdiction.
 17. Daily additional work tickets
 18. Photographs taken
 19. Services connected and disconnected.
 20. Equipment or system tests and startups.
 21. Partial completions and occupancies.
 22. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Daily Additional Work Tickets: Prepare daily additional work tickets recording the following information for a change in the work issued by a CCD. Tickets shall be documented separately for each trade labor category being performed that day and shall reflect at a minimum the following:
1. Date and day of the week

2. Change work being performed and percentage progress
3. Number of workers working on the change consistently and their respective work labor category.
4. Number of hours worked working on the change consistently per trade labor category.
5. Materials delivered and used specifically for the change work.
6. Equipment delivered and/or used specifically and consistently for the change work. If equipment already exists on site and is used to perform the change work, number of hours the equipment is used shall be documented.

2.4 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one (1) day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating and response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

- 2.5 GIS Mapping: When the subsurface is open and there are existing and new utilities and any abandon piping/ductbanks conditions exposed, Contractor is responsible for subcontracting with a surveyor proficient in GIS mapping to collect the metadata as outlined by the Owner of the utilities or abandon piping/ductbanks before back filling. Should Contractor fail to properly survey the conditions, at the Contractors cost, they shall open up the subsurface so that such conditions can be properly documented as outlined.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's CPM Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled project and progress meetings.
 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated two week look ahead schedule concurrently with the report of each such meeting. In the event the updated Schedule exceeds the Construction Completion date recognized in the contract, the Contractor must accompany the update with a recovery schedule.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of the updated schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01-3200

SECTION 01-3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Contractor's construction schedule
2. Submittal schedule
3. Shop Drawings
4. Coordination Drawings and Layout
5. Daily Construction Reports
6. Product Data
7. Samples
8. Site Mobilization Plan
9. Safety Plan
10. Background Screenings

- B. Related Requirements:

1. AIA Document A101 Contract Article 5 "Payments" for submitting Applications for Payment and the schedule of values.
2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with

requirements contract. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

- C. Portable Document Format (PDF-Adobe Pro): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 30-60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's CPM construction schedule which is due within twenty (20) days from contract execution.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in a tabular format:
 - a. Project Name and Project Number
 - b. Scheduled date for first submittal.
 - c. Specification Section number and title.
 - d. Submittal category: Action; informational.
 - e. Name of subcontractor.
 - f. Scheduled date for Engineer's final release or approval.
- B. Submittals Initially Required: Contractor shall initially submit for review prior to or at the pre-construction meeting the following submittals not limited to:
 - 1. Emergency / Point of Contact Information: Point of contact shall be persons whom are directly employed by the Contractor who are designated to be available 24/7 for the duration of the project. Such person(s) shall be accessible and responsive. Such responsiveness shall also include but not be limited to remedies to the perimeter construction fence and security breaches to the project site.
 - 2. Contractor's Health and Safety Plan specific to the project: Prior to, and as a condition of mobilization on site, the Contractor shall submit a Safety Plan consisting of no less than the following information:
 - a. Safety Data Sheets for all potentially harmful substances.
 - b. A list of Contractor, Subcontractor, and Owner personnel to be notified in the event of an emergency.

- c. A list of Contractor's personnel to be notified by the Owner in the event of an emergency during "off" hours.
- d. Evacuation Plans.
- e. Emergency medical procedures.
- f. Locations of emergency medical equipment.
3. Contractor's Quality control plan specific to the project.
 - a. Outline responsibilities within the Contractor's project team.
 - b. Responsibility with review of submittals being received from their subcontractors before passing them along to the Engineer. What are the mechanisms within your process of review of your various trade submittals to ensure proper coordination has been performed prior to forwarding the submittals to the Engineer?
4. Detailed CPM Construction Schedule specific to the project detailed in a format required within the contract documents.
 - a. Breakdown complete Submittal Schedule.
5. List of all Subcontractors and Suppliers in a format required by the Owner
6. Background Screening Control Plan (where applicable)
7. Labor Rate Submissions for all sub and sub-tier subcontractor's self-performed trade labor work and each classification. Follow the requirements outlined within other sections of Division One.
8. Specific Trade Certification Submittals, not limited to:
 - a. Telecommunication technician certifications (where applicable)
 - b. Millwork certification (where applicable)
 - c. Millwork installer certification (if different from the millwork fabricator)
 - d. Contract Arborist (where applicable)
 - e. ACI certification for flatwork concrete installations
 - f. AWI certification for fabrication and installation of millwork product
9. Erosion Control Plan
10. Any proposed Changes to the Site Logistics Plan and a justification for why it is being proposed.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Processing Time: Allow time for any submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt, Commissioning Agent's

receipt and Official having jurisdiction receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow fourteen (14) days from receipt for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow fourteen (14) days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Engineer's consultants, Owner, or other parties is indicated, allow twenty-one (21) days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Engineer and to Engineer's consultants, allow fourteen (14) days for review of each submittal. Submittal will be returned to Engineer before being returned to Contractor.
- C. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Name of subcontractor.
 - f. Name of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

- a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Owner.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return without review submittals received from sources other than Contractor.
 - a. Transmittal Form for Paper Submittals: Use AIA Document G810 or similar format.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 1. Assemble complete submittal package into a single indexed file incorporating paper submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.R1).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.
 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Engineer.
 - d. Name of Contractor.
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Specification Section number and title.
 - h. Related physical samples submitted directly.
 - i. Indication of full or partial submittal.
 - j. Transmittal number.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
- E. Options: Identify options requiring selection by Engineer.
- F. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, and installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections. Transmit each submittal from Contractor to Owner using a transmittal form.
1. Submit electronic submittals as PDF-Adobe Pro electronic files.
 - a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Action Submittals: Submit five (5) paper copies of each submittal unless otherwise indicated. Engineer will coordinate reviews and incorporate comments received from officials having jurisdiction and return four (4) copies, one to Owner, two to Contractor and one to the official having jurisdiction.
 3. Informational Submittals: Submit five (5) paper copies of each submittal unless otherwise indicated. Engineer will not return copies.
 4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Notation of coordination requirements.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. Four (4) paper copies of Product Data unless otherwise indicated. Owner will retain one (1) copy and Engineer will retain one (1) copy; remainder will be returned.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 3. Submit Shop Drawings in the following format:

If five (5) opaque copies of each submittal. Owner will retain one (1) copy, official having jurisdiction will retain one (1) copy and Engineer will retain two (2) copies; remainder will be returned.
- D. Samples: Submit physical Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:

- a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
3. For projects where electronic submittals are required, provide corresponding electronic submittal in addition to physical Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; mock-ups, swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three (3) sets of Samples. Engineer will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.
- E. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

- G. Application for Payment and Schedule of Values: Comply with requirements specified in Division 00 Section "Payment Procedures."
- H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
- J. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- K. Site Mobilization / Logistics Plan
 - 1. Prior to the start of operations on the site, the Contractor shall submit to the Owner, a Site Mobilization Logistics Plan which shall indicate pertinent dates and times, logistics, construction fence, laydown area, traffic flow and compliance with the General Requirements to a level of detail commensurate with the complexity of the construction and the sensitivity of the Owner's ongoing activities on site.
- L. Safety Plan
 - 1. Prior to, and as a condition of mobilization on site, the Contractor shall submit a Safety Plan consisting of no less that the following information:
 - a. Material Safety Data Sheets for all potentially harmful substances.
 - b. A list of Contractor, Subcontractor, and Owner personnel to be notified in the event of an emergency.
 - c. A list of Contractor's personnel to be notified by the Owner in the event of an emergency during "off" hours.
 - d. Evacuation Plans.
 - e. Emergency medical procedures.
 - f. Locations of emergency medical equipment.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three (3) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, design loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."

Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review. Any re-review of any one submittal beyond two reviews by the Engineer (not a direct cause by the Engineer), costs associated for their continued review(s) shall be at the Contractor's expense.

- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ENGINEER'S ACTION

- A. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return the submittal to contractor, Owner will receive final approved submittal from the Engineer. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Engineer without action.

END OF SECTION 01-3300

SECTION 01-4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Requirements:
 - 1. Division 01 Section "Allowances" for testing and inspecting allowances.
 - 2. Divisions 01 section Close out
 - 3. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where

indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

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

appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Engineer.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Engineer.
 - 3. Any other delegated design work required within the contract documents.
- D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit project specific quality-control plan within ten (10) days of Notice to Proceed, and not less than five (5) days prior to preconstruction conference. Submit in format acceptable to Owner. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

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

1.7 REPORTS AND DOCUMENTS

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

4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Certification that conditions, products, and installation will satisfy all aspects of the warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Certification that conditions, products, and installation will satisfy all aspects of the warranty
 5. Other required items indicated in individual Specification Sections.

1.8 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced and certified in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

- G. **Testing Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. **Manufacturer's Technical Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. **Mockups:** Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Engineer.
 - 2. Notify Engineer seven (7) days in advance of dates and times when mockups will be constructed.
 - 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 5. Obtain Engineer's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven (7) days for initial review and each re-review of each mockup.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Demolish and remove mockups when directed unless otherwise indicated.

1.9 QUALITY CONTROL

- A. **Owner Responsibilities:** The Owner will provide independent inspections, tests, and similar quality control services specified to be performed by independent agencies and not by the contractor, except where they are specifically indicated as the contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.
 - 1. The Owner will employ and pay for services of an independent agency and furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents, cancellation of a scheduled test short of the required time the testing agency has mandated or in instances where the work is not prepared for testing within a reasonable amount of time from arrival of the testing

agent, will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

- B. Contractor Responsibilities: Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify the Owner and testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Engineer, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Owner, Engineer, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owners Representative, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Engineer.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Owner and Engineer's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01-4000

SECTION 01-5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary services and facilities, including:

1. Utilities
2. Temporary construction
3. Construction aids
4. Barriers and enclosures
5. Security
6. Access roads
7. Temporary controls
8. Traffic control
9. Project identification signs and banners
10. Site Logistics
11. Field offices and sheds
12. Temporary use of Roads and Campus grounds
13. Maintenance of temporary services and facilities

- B. Related Requirements:

1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.
2. Divisions 01 Section "Temporary Tree and Plant Protection" for protection and pruning of existing trees and plants that are affected by execution of the Work.
3. Division 31 Section "Dewatering" for disposal of ground water at Project site.
4. Division 32 Section "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
5. Division 32 Section "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

- C. Temporary utilities may include but are not limited to:

1. Temporary electric power and light.
2. Temporary heating, cooling and ventilating.
3. Telephone service.
4. Water services and distribution.
5. Temporary sanitary facilities, including drinking water.

6. Temporary sewers and drainage
 7. Temporary fire protection.
- D. Security may include but is not limited to:
1. On-Site -24hour security
 2. Security enclosures, fences and lockups
 3. Gate attendants and gate house
- E. Temporary use of access roads and parking include but are not limited to:
1. Temporary roads and paving
 2. Temporary use of grounds for parking, access and laydown space
 3. Use of public and private roads to the project site.
- F. Temporary controls may include but are not limited to:
1. Dewatering facilities and drains
 2. Waste disposal
 3. Rodent and pest control
 4. Environmental protection
 5. Nuisance dust control
 6. Noise control.
 7. Site area fencing
 8. Safety controls
 9. Covered walkways at entrances and other locations
 10. Protection of grounds including protection of existing hard and soft scape surfaces.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Engineer, testing agencies, and Owner's contractor and authorities having jurisdiction.
1. Contractor shall furnish and install all necessary temporary switches, wiring, fixtures, bulbs, piping and other devices as may be required to connect to existing systems.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use for the temporary facility without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations. The Owner reserves the right to require the Contractor to install meters and, if obvious excessive use is observed, to pay for these utilities. Should water restrictions be issues, the use of surface water on Owner's properties or water system of any kind shall be prohibited. Periodic water restrictions have been experienced within the months of July, August and September. And during periods of water restrictions, contractor shall be responsible for providing water to support the project at no cost to the Owner.

1. When water restrictions are in place, Contractor shall provide clean filtered water to the project at no additional cost.
 2. The use of water course water is prohibited.
 3. The use of water from any fire hydrant without prior permission from the authority having jurisdiction is strictly prohibited.
 4. Contractors who violate these provisions shall be billed at a cost to the contractor at a rate triple the cost if the water had been purchased and supplied by a reputable source. In addition, if it is found that water was supplied from a watercourse, the Contractor shall be responsible for all testing costs associated on the materials the water was used for and the water itself, for any contaminants or organic matter not suitable for the applied use. Contractor shall be responsible for cost of removal of the impacted materials and their replacement.
- C. Electric Power Service from Existing System: A moderate quantity of electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations. The Owner reserves the right to require the Contractor to install meters and, if obvious and excessive use is observed, to pay for these utilities.
- D. Traffic Control: Contractor is responsible for all traffic control requirements and costs. Any state or local road work must have a traffic control police officer present. Any off road work must have a certified flagman. See further details on Safety and Traffic Controls within this section.

1.4 INFORMATIONAL SUBMITTALS

A. Site Mobilization Logistics Plan:

1. Prior to and as a condition of mobilization on site, the Contractor shall submit to the Owner, a Site Mobilization Logistics Plan which shall indicate pertinent dates and times, logistics, construction fence, laydown area, traffic flow and compliance with the General Requirements to a level of detail commensurate with the complexity of the construction and the sensitivity of the Owner's ongoing activities on site.
2. Contractor's Site Mobilization Logistics Plan shall be within the limits reflected on the contract documents and in a form consistent with the contract documents, specifically the Site Logistics Guidance Plan established by the Owner and Engineer. The Contractor Site Logistics Plan, shall be sized the same as the plan sheets in the contract documents and address the following, including but not limited to:
 - a. Phases of work, each phase and all work should be documented
 - b. Pedestrian Circulation/Detours, ADA Access
 - c. Site lines within the construction fence and outside the construction fence.
 - d. Safety within the construction fence and outside the construction fence.
 - e. Emergency vehicle circulation, 18' minimum width
 - f. Vehicular Circulation/Detours
 - g. Tracking pads
 - h. Construction Circulation
 - i. Site perimeter fencing system location
 - j. Signs including vehicular and pedestrian detours, project sign and project banners, including their anticipated respective locations.

- k. Staging Area / Stockpile Area
 - l. Trailer with allowable parking spaces
 - m. Portable Restrooms
 - n. Temporary Utilities hookups
3. Provide the following for discussion regarding the Site Logistics Plan:
- a. Submittal of the perimeter area Construction Site fencing system: Type (driven/temporary), fence height, fence construction and installation details taking into account the necessary durability during the seasons, and (i.e. snow plowing).
 - b. Submittal of the scrim that connects to the fence system.
 - c. Regular maintenance controls of the temporary facilities, fencing and grounds within the fenced in area and accesses to the Construction Site area.
 - d. Construction Equipment and Vehicle parking requirements anticipated.
 - e. Proposed safety and security measures for the Construction Site.
 - f. Heavy equipment special needs
 - g. Identify where existing parking spaces are impacted by the project limits reflected on the contract documents Site Logistics Plan. Should the project limits change from what is included on the contract documents through no fault by the Owner, and the area needs impact additional parking spaces from what was previously anticipated or additional temporary fencing is required than what was anticipated on the Site Logistics Plan, the Contractor shall bear all costs associated without additional compensation.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
- 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.

1.5 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations and authorities having jurisdiction, including but not limited to:
- 1. Building Code requirements
 - 2. Occupational Health and Safety regulations
 - 3. Utilities regulations and requirements
 - 4. Police, Fire Department and Rescue Squad requirements.
 - 5. Environmental protection regulations.
- B. Standards: Comply with NFPA Code 241, "Standard for Safeguarding Construction, Alteration, and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."

- C. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with National Electric Code (NFPA 70) and local provider requirements and officials having jurisdiction. Permit is required.
- D. Tests and Inspections: Arrange for authorities having jurisdiction and service providers to observe installation, testing and inspection for each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates of implementation and termination of each temporary utility. At the earliest feasible time and when acceptable to the Owner, change over from use of temporary services to use of the permanent service.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire preventative measures. Do not overload facilities, or permit them to interfere with progress of work. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.
- C. Construction Site Area: Keep area within and around the perimeter construction fence clean and neat in appearance.
 - 1. Fence system installation and appearance shall be regularly maintained including but not limited to grommets and ties associated with connecting and maintaining toughness of the scrim, fence fabric and/or rails, cleaning scrim, weed whacked,
 - 2. Roads and pathways are to be regularly swept clean of dirt and construction debris. Debris must be properly disposed of in a manner acceptable to the Owner.
 - 3. Completely remove from campus snow and ice on roads and pathways leading from and to the construction site. Stock piling of snow and ice or pushing snow outside the construction fence is not permitted.
 - 4. As growing seasons demand, lawn areas to be kept mowed, planting beds to be kept free of weeds and any tree or scrub trimming is to be performed by plant maintenance personnel.

Maintaining outside the perimeter fence, mowing and plowing shall be maintained up to the transition area between the fence and area limit line where the Owner has mowed or plowed to.

Always operate and conduct construction activity in a safe and efficient manner. Maintain emergency access and circulation to the facility(s) at all times.

- D. Construction Fencing System: The temporary fencing system consists of the fence fabric, rails, poles, and scrim.
 - 1. The system shall be installed immediately as the first step for on-site mobilization. As each section of the fence installation is complete, immediate installation of the scrim shall follow. Fencing system installation shall not commence until all products that make up the system have been delivered to the site and confirmed as meeting the specification requirements. Fencing system shall not be left incomplete over a weekend or holiday. Leave fence system complete with associated scrim and/or banners for the portion of fencing system that has been installed. The Contractor shall not proceed with any other mobilization work until the entire perimeter construction fencing system is complete and in place including the project sign.

2. Fence system shall not be moved or removed without prior authorization from the Owner.
 3. In cases where there are safety or environmental conditions, Owner shall direct the Contractor to relocate portions of the fence system at no additional cost to the Owner.
 4. Prior to fence system removal, the following conditions are required to be complete:
 - a. All excess material and equipment shall be removed from the grounds.
 - b. All vehicle parking immediately within the immediate grounds ceases.
 - c. All hardscape work has been completed (where feasible).
 - d. Complete washing of Owner supplied printed graphical scrim and/or banners.
 5. Upon authorization from the Owner to remove the fence system, the Contractor shall perform the following not limited to:
 - a. Careful removal, package neatly and secure Owner provide back to the Owner printed scrim and banners. Contractor shall deliver to Owner's designated facility for storage.
 - b. Where work was impeded by the fencing system, immediate commence with required planting and grading work.
- E. Project Signage: Project signage consist of the Project Construction Sign, the Project Banners and any safety and/or directional signage. All project signage shall be installed and complete within 24 hours of the fence system completion and before work can commence within the site fenced area. Any signage beyond those listed must be preapproved by the Owner prior to posting or installing.
- F. Any other signage shall be prohibited on the fence system, site or temporarily attached to equipment or cranes.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. Undamaged previously used materials in serviceable condition may be allowed but only at the Owner's acceptance. Costs borne by the Contractor to obtain acceptance from the Owner of used material is at the Contractor's expense. Provide materials suitable for the use intended.
- A. Chain-Link Fencing: All fence components shall be new or in like new condition, deviations from those requirements must be preapproved by the Owner. No bent or deformed fence components will be acceptable and shall be replaced immediately upon request. All fence posts shall be driven, set plumb and cut off so that they do not protrude beyond top of fence.

Construction fencing system shall be engineered.

1. Fence Height: 8' Height; Fence Material and components: Galvanized Steel
2. Fence Fabric: 2 inch opening, 9 gauge, salvage knuckle
3. Line Posts: 2-3/8 inch OD minimum, however will be dependent on height of fence required.
4. Corner Posts: 2-7/8 inch OD, however will be dependent on height of fence required
5. Top and Bottom Rails: 1-5/8 inch OD, with boulevards.
6. Supporting Posts: Driven and reinforced as required
7. Post Caps: Acorn or loop, all post shall receive caps

8. Installation: All components shall be square, level, taught and properly secured.
- B. Portable Panel Chain Link Fencing: All fence components shall be new or in like new condition. All panels shall be installed plumb horizontal (not perpendicular) and no bent or deformed fence components will be acceptable and will be replaced immediately upon request. Panels shall be attached to each other via heavy duty couplers to aid in support
1. Fence Height: 8' Height
 2. Fence Material and components: Galvanized Steel
 3. Fence Fabric: 4" x 2" opening, 11 gauge welded mesh,
 4. Panel Frame: 1-5/8 inch OD
 5. Portable Panel Fence Feet: Plastic or rubber black coated concrete filled feet suitable for proper security and safety of the fence system during any type of weather and/or vandalism events Contractor shall not rely on or assume the use of sand bags. If sand bags will be allowed, they can only be used behind the fence within the construction area and shall be all black in color. Support Stays: Shall be installed every 3 panels or as required by fence manufacturer at a minimum to provide extra stability and maximum strength, support shall have a weight of a minimum of 210 pounds. Contractor shall be responsible to obtain engineered support stays necessary to ensure fence stability in cases of any type weather event.
 6. Installation: All components shall be square, level, taught and properly secured.
- C. Scrim: If conditions allow for plain scrim, scrim shall be in new or like new condition. Torn scrim will not be acceptable and will be replaced immediately upon request.
1. Plain Woven Scrim
 - a. Color: Dark Green
 - b. Size: One piece, full height 8'
 - c. Opacity: 75% minimum
 - d. Edge Treatment: Reinforced sewn edges with grommets every 12" o.c
 - e. Attachment: Zip ties color black at 12" o.c. along perimeter, Scrim shall be installed with consistent equal spacing on top and bottom of the fence height. Shall be taught with no ripples. For portable chain link fencing systems, the scrim shall be installed to cover the fence fabric and posts per portable panel.
 2. Printed Graphical Scrim
 - a. Attachment: Zip ties color black at 12" o.c. along perimeter, scrim must be continuously taught against each chain link panel.
- D. Live Screening: If live screening is required, plantings are to be maintained and kept healthy throughout the course of the project including watering, mulch and trimming as needed.
- E. Concrete Barricades: Barricades shall be in new or like new condition. Like new conditions shall be defined as having no paint, markings, cracks or gauges on the expose surface. Barricades shall meet CTDOT and Owner standards.
1. Height: 32 inches' minimum
 2. Length: 6-foot minimum
 3. Width: 24 inches at the base and 6 inches at the top
 4. Barricade shall be wrapped with scrim and be able to accept fencing.
- F. Green Safety/Snow Fence: Green safety/snow fence may be utilized for work areas as approved by the Owner. Safety/Snow fence shall not be utilized to protect newly installed landscape areas.

1. Color: Dark Green
 2. Size: 4' Height
 3. Openings: 3.5" x 1.75"
 4. Posts: Steel Green 1" Min
- G. Newly Landscape Area Controls: Stakes and rope shall be utilized for protecting newly seeded/sodded areas to restrict access to and to protect from pedestrian and vehicular traffic. Once area has been determined to be accessible to pedestrian traffic, Contractor shall remove stakes and rope, wash clean and turn over to the Owner.
1. Stake: Eco-Step Stake or approved equal
 2. Size: 32" height
 3. Color: Green
 4. Rope: ¼" diameter polypropylene braided rope, color green
- H. Safety Controls: Safety or Traffic Cones shall be in new or like new condition. Like new conditions shall be defined as having no paint, markings, cracks or gauges on the expose surface. Cones shall meet the following standards:
1. Road traffic control cones or tubes shall be florescent orange or florescent yellow in color for CTDOT / MUTCD requirements.
 2. Grounds Safety Cones shall be lime green in color per Owner requirements.
- I. Dust-Control
1. Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.
 2. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
 3. Gypsum or Plywood Wallboard: Provide gypsum wallboard complying with requirements of ASTM C 36 on interior walls of temporary partitions.
 4. The use of calcium chloride or other chemicals for dust control shall be submitted for approval to the Owner prior to its use.
- J. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- K. Water: Provide potable water approved by local health authorities.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Engineer and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 2. Conference room of sufficient size to accommodate meetings of a minimum ten (10) individuals. Provide electrical power service and 120-V ac duplex receptacles, with no

less than one (1) receptacle on each wall. Furnish room with conference table, chairs, and four (4) foot square tack and marker boards.

3. Drinking water and private toilet.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 75 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

D. Electrical Power Cords: Power cords shall never be subject to physical damage. Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

E. Lamps and Light Fixtures: Provide general service LED lighting with wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior LED fixtures where exposed to moisture.

F. First Aid Supplies: Comply with governing regulations.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use qualified personnel for design and installation of temporary facilities. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- C. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Owner and shall be built with labor and materials furnished by the Contractor without expense to the Owner. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed at its expense upon completion of the Work. With the advanced written consent of the Owner, the temporary buildings and utilities may be abandoned and need not be removed.
- D. Noise Control: The Contractor shall make every effort to minimize noise disruption to occupants of buildings and adjacent buildings. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site. No noise generating work that interferes with classroom operation shall be tolerated. No noise generating work shall be allowed during exam periods where the noise will impact classroom functions. Examples of noise generating work include, but are not limited to sawing, drilling and hammering and/or jackhammering.
 1. Avoid use of tools and equipment, which produce harmful noise. No gasoline-powered equipment shall be used during times that the buildings are occupied. No gasoline-powered equipment may be used in the interior of buildings at any time.
 2. Refer to 01-1000 Summary as well as 01-5719 Temporary Environmental Controls for more requirements on Noise, Vibration and Odors.
- E. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.
 1. All removed materials that are salvageable are the property of the Contractor unless otherwise noted in the specifications.
 2. All debris resulting from the performance of this contract will be the property of the Contractor and will be completely removed from the campus and disposed of in a legal manner.
 3. Chutes shall be black in color and dumpster type containers designed to keep dust and spillage to a minimum will be used by the Contractor. Dumpsters will be completely covered with a waterproof covering at all times when not in use. Remove from the site daily of all dumpsters that are full or overflowing.
- F. Nuisance Dust Control: The following provisions shall apply during demolition or construction phases of work:
 1. It is the intent of this specification to insure that nuisance dusts resulting from demolition or construction activities do not impact occupied areas of the building and surrounding the site. The Contractor shall take all measures necessary to accomplish this goal. These

measures will include as minimum polyethylene sheeting or wet methods of fugitive dust control. Keep all adjacent roads free and clear of dust and debris.

2. The Contractor shall submit a plan prior to commencement of work that will detail all methods of dust control. This plan shall be approved by the Owner prior to commencement of work. Failure to comply shall result in immediate stoppage of work until effective dust control measures are employed.

3.2 TEMPORARY UTILITY INSTALLATION AND CONTROLS

A. General: Installation of temporary service or connecting to existing service.

1. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
2. Arrange with appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
3. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.
4. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
5. For temporary service or connection to existing or new service: The Owner must be notified at least four (4) weeks in advance of any proposed interruption in order that all affected departments may be advised and have time to adjust their schedules accordingly. For new service, there are limited times within a year that the services can be impacted for a total shut down. Arrange adequate time with the Owner in preparation for the shutdown connections. Construction schedule must allow for advanced notification. Failure to plan ahead and notify the Owner of a pending shut down shall not relieve the Contractor from lost time. Owner reserves the right to limit the down time to a specified number of net hours and to set the date for each occasion of complete shutdown.
6. Any service (steam, water, electricity, etc.) shutdown which will interrupt the continuity of an experiment or be detrimental to a research project or which, in the opinion of the Owner, is required for other valid reasons, shall be maintained by safe and adequate temporary means and such temporary piping, wiring and associated devices shall be removed when no longer required.
7. Sewers and Drainage: If sewers are available, provide temporary connection to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.
8. Connect temporary sewers to the municipal system as directed by the sewer department officials.
9. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

10. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction. Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
 11. Sterilization: Sterilize temporary water piping in accordance with AWWA requirements prior to use.
- B. General: Installation of any Utilities
1. Soils: Filter out soil of construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.
 - a. Residual soils shall be tested for contaminants prior to its removal from Owner's contiguous property.
 - b. Testing shall be in compliance with the residential direct exposure criteria and/or the applicable pollutant mobility criteria.
 - c. Soils cannot be transported from one Owner property to another without testing and acceptance of the test results by the Owner.
 - d. Residual soils shall not be saved and stock piled on any Owner property, without prior written approval from the Owner.
 2. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - a. Use of Owner's existing sanitary facilities will not be permitted.
 - b. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
 - c. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used materials.
 3. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
 4. Provide safety showers, eyewash fountains and similar facilities for convenience, safety and sanitation of personnel
 5. Drinking Water Facilities: Provide drinking water including paper supply.
 6. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 7. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
 8. Steam from the Owner's steam lines shall be provided at no cost to the Contractor. Contractor shall supply, install and maintain all temporary piping, radiators or unit heaters, reducing valves, steam traps and other necessary fittings and accessories. Traps shall be provided to prevent steam from entering main returns. The temporary heating

plan shall meet the approval of the Architect/Engineer, Fire Marshall and Owner. Provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperature or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

9. The Contractor shall provide temporary heat during construction for interior areas included in the Contract, and any adjacent or nearby occupied areas, to counteract low temperatures or excessive dampness and in any event, between October 15th and May 15th, maintain during said period or periods until final completion of the Contract, unless otherwise approved by the Owner in writing. Provide heat and ventilation to maintain specified conditions for construction operations and to protect materials and finishes from damage by temperature or humidity. All installation and operating costs shall be paid by the Contractor. Unless otherwise specified in the Contract Documents, the temporary heating shall be sized to maintain the following conditions on a 24-hour-per-day basis:

Occupied Dormitory or Living Areas: 68 degrees F

Office Spaces/Laboratories/Classrooms: 68 degrees F

Warehouses/Storage: 55 degrees F

The areas listed above are for example only. The Owner shall have sole discretion to assign minimum heating criteria.

10. Electrical Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.
11. Except where overhead service must be used, install electric power service underground.
12. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance
13. Lighting: Provide weatherproof, grounded LED lighting
14. Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
15. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction and traffic and safety conditions.
16. Install exterior yard and sign lights so that signs are visible when Work is being performed.

17. Security: Provide temporary security of the construction site to fulfill safety and security requirements. Protect all workers, stored and installed materials, equipment and property during and after working hours.
18. Telephones: Provide temporary or cellular telephone service for all personnel engaged in construction activities, throughout the construction period. Contractor shall arrange and pay for his own telephone service.
19. Distribute to the project Team and Post for public viewing a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.

C. Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
4. Provide supervision of all welding operations, combustion type temporary heating units, and similar sources of fire ignition.
5. No gasoline shall be stored in or close to the building at any time.
6. Facilitate fire department access and review.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Engineer Schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
3. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.

4. Ensure that any existing walkways, egress paths, exterior lighting or emergency phones impacted by the construction area are relocated.
- B. Field Offices and Sheds: A field office is (not) required for this project, however should the Contractor choose to provide a field office, see requirements below:
1. Provide non-combustible construction for offices, shops and sheds located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.
 2. Field Offices: Provide insulate, weather tight temporary offices with electric lighting, air conditioning and heat and of sufficient size to accommodate required office personnel at the Project Site. The Field Office shall have two rooms, each approximately 150 square feet in size. The offices shall have ample natural light, a heater of sufficient capacity to maintain 70 degrees F in winter and an air conditioner of sufficient capacity to maintain 75 degrees F in summer. No trailer will be allowed on Owner property unless permanent markings indicating the name of the company are clearly visible. Keep the office clean and orderly of use for small progress meetings. Furnish and equip offices with a minimum of the following:
 - a. Furnish with desks and chairs, file cabinets, plan tables, plan racks, waste receptacles, conference room table and at least eight chairs.
 - b. Equip with a water cooler and private toilet complete with water closet, lavatory and mirror-medicine cabinet unit.
 - c. Equip with a 5 lb ABC fire extinguisher and an OSHA-approved first aid kit.
Equip with a facsimile machine and copier for use by the Contractor, Owner e and Architect/Engineer.
- C. Temporary Roads and Paved Areas: Comply with the following:
1. The Contractor shall, under regulation prescribed by the Owner, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Owner. When materials are transported in prosecuting the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage and provide appropriate traffic markings and cross walks. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.
 2. Provide dust-control treatment that is non-polluting and non-tracking. Reapply treatment as required to minimize dust. The use of calcium chloride or other chemicals for dust control shall be submitted for approval to the Owner prior to its use.
 3. Construct and maintain temporary roads and paving to adequately support the indicated loading and to withstand exposure to traffic during the construction period. Locate temporary paving for roads, storage areas and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Engineer.
 - a. Paving: Comply with Division-2 Section “Asphalt Concrete Paving” for construction and maintenance of temporary paving.

- b. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.
 - c. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas that are without damage or deterioration when occupied by the Owner
 - d. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion, unless it adversely effects the site and access road. Coordinate with weather conditions to avoid unsatisfactory results.
 - e. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration and supervision.
 - f. Contractor shall sweep and remove all construction debris from all roads outside of construction zone daily or more frequently as is required by weather conditions and/or to the satisfaction of the Owner.
 - g.
- D. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
- 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
 - 3. Recondition base after temporary use, including removing contaminated material, regrading, proof rolling, compacting, and testing.
 - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."
 - 5. Maintain access for fire-fighting equipment and access to fire hydrants.
 - 6. Contractor shall sweep and remove all construction debris from all roads outside of construction zone daily to the satisfaction of the Owner and those having jurisdiction at the Contractor's expense.
- E. Use of Existing Roads: Contractor shall comply with Owner's requirements for use of existing roads within Owner's property and outside Owner's property.
- F. Temporary Use of Owner's Property: Use of the Owner's grounds for access and laydown shall be as outlined in the Site Logistics Guidance Plan. The protection of trees, planting beds, lawns and soil structure shall be the primary focus.
- 1. Install tree and plant protection prior to the installation of other site fencing
 - 2. Limit vehicle traffic and staging to designated areas to prevent soil compaction. Employ surfaces that protect the underlying soil structure during construction
 - 3. Maintain trees, lawn areas and planting beds during construction so green material is thriving at the conclusion of the project.

4. Submit restoration plan for these areas including decompaction, pruning, mowing, fertilizing, etc. prior to returning the campus grounds to the campus open space fabric.
- G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice to minimize accumulations within the construction site and shall not impact safe travel of grounds outside the construction site.
 - a. Remove from the construction site, haul and dispose outside of Owner property. Contractor shall not dispose on any Owner property under any condition.
 - b. Approved de-icing products for all Owner campuses include:
 - 1) Rock salt treated with a pre-wetting agent containing a corrosion inhibitor with a minimum 30% magnesium chloride.
 - 2) Calcium chloride
 - 3) Magnesium chloride
 - c. Sand is not permitted
 3. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- H. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- I. Existing Stair Usage: Use of Owner's existing emergency stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
- J. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.
- 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION
- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities systems and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities at no cost to the Owner
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Division 01 Section "Summary."

- C. Temporary Erosion and Sedimentation Control: Comply with the latest requirements of DEEP General Permit for the discharge of stormwater and dewatering wastewaters from construction activities or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section "Site Clearing."
- D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of the latest DEEP General Permit for the discharge of stormwater and dewatering wastewaters from construction activities or authorities having jurisdiction, whichever is more stringent.
1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
 2. Inspect, repair, and maintain erosion and sedimentation-control measures during construction until permanent vegetation has been established.
 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- F. Tree and Plant Protection: Comply with requirements specified in Division 01 Section "Temporary Tree and Plant Protection."
1. Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- G. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials. With the exception of stinging insects.
- H. Site Enclosure Fence: Prior to commencing any work or mobilization, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering the site except by entrance gates. All fencing to have dark green reinforced scrim sheeting.
1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations or as indicated on Drawings and noted in the approved Site Logistics Plan.
 - a. Prior to fence installation, a fence system submittal shall be submitted and approved by the Owner. A pre-installation conference shall be held with all sub-contractors and workers responsible for supplying and installing the fence to go over the plan and the expectations.
 - b. All fence material, fence fabric, posts, panels, feet, scrim and banners shall all be on site prior to commencing installation.
 - c. Site fence shall be installed in accordance with the following

- 1) Fence Posts and the top and bottom rail shall be installed and cut to appropriate height/length.
 - 2) Chain link fence shall be installed. Fence posts shall not exceed the fabric installation by more than 50 feet.
 - 3) Reinforced scrim shall be installed. Chain link fence shall not exceed the scrim installation by more than 50 feet. Scrim shall be installed flush with the top of the fence so that the top salvage knuckle is not visible. Scrim shall then be stretched tight to cover the entire height of the fence. Horizontal joints shall not be permitted. The scrim shall be taught and free of wrinkles. Vertical scrim joints shall be overlapped to give the appearance of continuous piece of scrim.
 - 4) Contractor to install owner provided decorative banners on the exterior side of the site enclosure fencing as directed by Owner.
2. Phasing of work: As the work progresses, depending on safety and limitation conditions, the Contractor shall relocate or reduce the site fencing as required at no additional cost to the Owner.
- I. Security Enclosure and Lockup: Install enclosure around partially completed areas of construction. Coordinate with Owner's Fire Marshall and install Owner provided lockable pad locks for entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Construction gates shall be closed at all times during the day to prohibit the general public from entering the site. Ensure no safety cones are left outside of the fence enclosure after deliveries. Lock entrances at end of each work day.
- J. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction and the Owner for erecting structurally adequate barricades, including warning signs and lighting.
- K. Temporary Egress: Maintain temporary egress from existing occupied facilities at all times and as required by authorities having jurisdiction.
- L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with Owner's fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
- M. Temporary Lighting and Security Phones: Installation of temporary fencing, temporary egresses, temporary enclosures, covered walkways and the like shall take into consideration the affects to existing lighting, cameras and emergency code blue phones. Relocate any existing lights and/or code blue phones in order to maintain sufficient lighting and line of site of blue phones.

3.5 TRAFFIC CONTROL

- A. Due to the large volume of pedestrian and vehicular traffic within the campuses, it shall be the responsibility of the Contractor to provide traffic and pedestrian accessibility to all areas of the campus as applicable.
- B. The Contractor shall comply with Connecticut Regulation 13b-17-28, Safety to Traffic, which requires that "When portions of the traveled way are made dangerous for the movement of vehicles or pedestrians, a sufficient number of uniformed police officers, flagmen, or traffic men, shall be employed by the permittee to direct traffic safely through the area."
- C. The requirement to maintain pedestrian and vehicular traffic is further defined in the Connecticut Department of Transportation Specifications Section 9.71, Form 818, which requirements are incorporated herein by reference.
- D. The Contractor is required to contact the Owner's Police Department to determine jurisdiction. Thereafter Contractor may contact the Town of Mansfield Police Department or other state or private sources directly to obtain the necessary manpower to comply with these regulations. The Owner shall be informed by the Contractor of his traffic control procedures prior to the commencement of construction. Any traffic control performed other than by Contractor self-performance shall be considered subcontracted.
- E. At all entrance gates a flag person shall be employed to coordinate project deliveries and manage pedestrian as well as vehicular traffic. This person shall also be responsible for closing the site access gates after each delivery.

3.6 PROJECT IDENTIFICATION AND SIGNS

- A. Project Identification Signs:
 - 1. Decorative banners for the site enclosure fencing shall be provided by the Owner and installed by the Contractor. Such banners shall be installed immediately following scrim installation. Utilize ties used for scrim.
 - 2. Decorative scrim for the site enclosure fencing shall be provided by the Owner and installed by the Contractor. Non-decorative scrim shall be supplied and installed by the Contractor.
 - 3. Construction Project Sign shall be provided and installed by the Contractor and shall simultaneously be installed with the installation of the temporary fencing.
- B. Temporary Signs: Prepare signs to provide directional and safety information to construction personnel and visitors. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs, except those required by law.
 - 1. All detour signs required by CTDOT shall be submitted to and approved by the Owner. The Owner reserves the right to adjust size, color and placement of signs.
- C. Other directional and detour Signs: Other directional and/or detour signs not required by the CTDOT shall adhere to project specific specification requirements and be submitted to the Owner for approval.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses directly related to the project.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 - 2. Prevent water filled piping from freezing.
 - 3. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion has been formally recognized.
- D. Termination and Removal: Unless the Owner requests that it be maintained longer, remove immediately each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction immediately when such temporary surface is no longer required.
 - 3. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that do not meet the material component requirements specified. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 - 4. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."
 - a. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
 - b. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.
 - c. Restore all existing facilities and grounds used during construction to specified requirement or to original condition. Restoration shall include but not limited to:
 - 1) Removal of compacted grounds area due to equipment and vehicular access and movement to and within the site work area. Adding of compost and other nutrients to the soil to meet the Project standards for lawn/turf establishment.

- 2) Pruning and mulching of existing planting beds that are within the construction fence area. Restore grass areas immediately surrounding and within the Construction fence area to blend with other surrounding plantings and grass areas maintained by the Owner. Should there be no Project standards for lawn/turf establishment, Contractor shall follow the Owner's requirements for turf restoration.
- d. Remove completely from ground surfaces all "call before you dig" and other pavement markings made in support of the project. Covering over of markings is not acceptable.

END OF SECTION 01-5000

SECTION 01-5640 – TREE PROTECTION AND PRESERVATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the protection and stress reduction of existing trees and vegetation that interfere with, or are affected by, execution of the Work, whether temporary or permanent. Work is to be coordinated with the contract documents which shall include a tree preservation plan authored by a certified arborist.
- B. The following specifications apply to work of the related to protection and stress reduction measures and coordination and oversight of the tree preservation Plan by the Owner. This work includes but is not limited to the following:
 - 1. Coordination of Temporary Tree and Plant Protection
 - 2. Selective tree removals for “Removal By Arborist” (RBA) (Contract Arborist) within Tree Protection Areas (TPAs)
 - 3. Root Pruning
 - 4. Temporary Site and Tree Protection Fencing and temporary sign installation referenced in Section 01-5000 Temporary Facilities and Controls
 - 5. Composted Mulching
 - 6. Liquid subsurface fertilization
 - 7. Temporary Limb Guying or Clearance Pruning for construction access
 - 8. Seasonal Supplemental Watering
 - 9. Monitoring and Treatment of Tree Health
 - 10. Supersonic Air Tool (SSAT) and Hand Excavation within the Critical Root Zones (CRZs)

1.3 DEFINITIONS

- A. Certified Arborist: Credential of an individual arborist issued and administered by the International Society of Arboriculture. This credential must be current and valid to qualify to use the copyrighted designation of “Certified Arborist”. Refer to www.isa-arbor.com for additional information.
- B. Contract Arborist: Arboricultural firm contracted to implement the approved tree preservation plans on site. All crews’ conduction arboricultural operations on site shall consist of at least one Certified Arborist who directly oversees all work by that crew. Arboricultural operations include, but are not limited to, pruning, tree protection device installation and maintenance (fence, matting, etc.), root pruning, air tool root excavation/exploration (SSAT), soil care activities, soil testing, mulch application, tree inspections, pesticide/chemical applications and

tree removal. Special qualifications submittal is required for review and approval below. Contract Arborist will be sub-contracted by the general contractor.

- C. Tree Protection Area (TPA): Area indicated on Drawings surrounding individual trees or groups of trees to be protected during construction.
- D. Supersonic Airtool (SSAT): Hand held tool designed to focus highly compressed air (90-125 psi) provided from a large air compressor (185-375 cfm) at speeds close to 1400 mph at the tip of the tool. Widely used by arboricultural firms and consultants for multiple purposes including but not limited to: root collar investigation, CRZ investigation, root pruning (especially large roots > 1.5" diameter or where existing underground cables or conduits are located, radial mulching and restoration of compacted soils, excavation for utilities within protected CRZs to minimize root damage from constriction.
- E. Tree Removal by Arborist: Action whereby the Contract Arborist removes trees designated for "Removal by Arborist" selected from inside the TPAs. Trees shall be taken down by hand sectionally, or directionally felled to minimize damage to adjacent tree canopies, root systems, or adjacent structures. Work shall be completed by a qualified contract arborist.
- F. Crown Pruning: Action by the Contract Arborist of pruning specific tree limbs to improve tree health, reduce hazard, and / or provide construction clearance.
- G. Supportive Cabling: Installation of supportive cabling for designated tree branches due to weak branch attachments.
- H. Root Pruning: Action indicated on Drawings to provide a more suitable cut for protected tree roots to minimize ripped or torn roots during excavations and grading with standard construction equipment. Various methods may be used.
- I. Mulching of Trees: Application of a wood mulch product to areas surrounding designated trees. Mulch increases moisture-holding capacity, helps mitigate soil compaction, and increases needed soil organic composition.
- J. Soil Amendments: Various product components applied to existing soil environment of protected trees, as indicated on Plan Notes.
- K. Tree Growth Regulator (*Paclobutrazol*): Products applied to designated trees used to regulate plant growth in such a way as to restrict canopy growth and free stored or produced energy for other uses in the tree. For highly impacted trees, more energy may be available for fibrous root growth (to combat root loss), thicker darker leaves (allowing for increased photosynthesis, and increased drought tolerance), and pest tolerance (often an issue with construction stressed trees); among other potential benefits.
- L. Limits of Disturbance (LOD) (also called Limits of Construction): Specific outer limits of all construction activities for the entire project.
- M. DBH (Diameter at Breast Height): Tree trunk diameter measured at 4.5 feet above grade.

1.4 SUBMITTALS

- A. The Contract Arborist shall provide submittals as follows:
1. Product Data: For each type of product indicated
 2. Certification: For each phase, the Contract Arborist shall certify for each tree designated to remain has been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
 3. Qualification Data: For Contract Arborist Firm Qualifications, submit firm and individual qualifications as follows:
 - a. Submit a minimum of two resumes and detailed qualifications from staff or team individuals assigned to this project as detailed under Quality Assurance below. Due to the complexity of this project, standard arboricultural experience may not qualify.
 - b. Provide references for above from a minimum of three commercial, non-governmental or governmental projects for whom similar tree preservation programs have been successfully implemented. Include the following information:
 - 1) Project Name, size and scope
 - 2) Number and species of trees involved
 - 3) Relevant photos or aerials
 - 4) Scope of services provided
 - 5) Name and contact for project owner, designer, or contractor.
 4. Pedestrian / Property Protection Plan: Contract Arborist to submit a written plan describing all protective measures proposed to be used. Protection measures shall be required for all on-site tree care activities including but not limited to Supersonic Airtool excavation, root pruning, canopy pruning, etc. to minimize potential impact to pedestrians and property.
 5. Maintenance Prescription: Contract Arborist shall submit for care and protection of trees as a result of construction, changes in weather patterns or events, and response in health from individual trees during and after completing the Work.
 6. Soil Samples: Submit soil sample for analysis during site work phase of this project. Take representative soil samples from all areas of protected trees (landscape areas and street tree planting pits). Samples and procedures per local cooperative extension shall be followed. Forward reports to Engineer and Owner.
 7. Soil Amendments: Contract Arborist shall submit specific fertilizer formulations, application rates and methods for review by Project Arborist. All fertilization and soil amendments shall be in conformance with soil test results.
 8. Site Documentation: Submit weekly reports to the Owner containing complete documentation of all tree impacts and tree preservation activities including but not limited to: root pruning, tree protection fencing, excavation within critical root zones, tree fertilization or other treatments, etc. Documentation shall include tree numbers of trees impacted and / or treated. Complete daily photographic record is also required.

9. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damaged caused by construction activities.
 - a. Use sufficiently detailed photographs or videotape.
 - b. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
10. Tree and shrub removal of additional plants not under base contract will require a “request to remove plantings” form to be submitted to the Owner for approval prior to starting the removal.

1.5 QUALITY ASSURANCE

- A. Certified Arborist (individual) Qualifications: An arborist certified by the International Society of Arboriculture (ISA) and licensed in the jurisdiction where project is located. All work performed by Contract Arborist including any oversight and documentation work, shall be performed or directly supervised by at least one on-site arborist with these minimum qualifications.
- B. Contract Arborist Firm Qualifications:
 1. Contract Arborist Firm shall comply with the following:
 - a. Established business with documented experience of at least five years.
 - b. Experience working on a minimum of three commercial, nongovernmental or governmental projects where similar tree preservation programs have been successfully implemented.
 - c. Properly licensed and insured to perform arboricultural work in the jurisdiction where the project is located.
 2. Provide names of each individual to comply with the following:
 - a. Minimum BS degrees in forestry, arboriculture, or related field and Certification in ISA.
 - b. Resumes should reflect combined 10 years full time experience on similar tree preservation projects.
 - c. Provide individual(s) names, certifications, and each anticipated role in this project. “Role(s)” shall be defined as one or more of the following:
 - 1) Project Manager
 - 2) Technical Oversight
 - 3) Field Arborist / Technician
 3. For each staff member, list a minimum of three construction projects and a minimum three years’ experience in the following technical applications:
 - a. Soil amendment prescriptions and applications
 - b. Supersonic Airtool Excavations for underground utilities exceeding 24” depth.
 - c. Root Protection Matting or similar applications
- C. Part of this work to extent referenced shall include but not be limited to the following:
 1. ANSI A300 Standard Practices for Trees, Shrubs, and Other Woody Plant Maintenance.
 2. Part 1-2001, Tree Pruning;
 3. Part 2-3004, Fertilization;

4. Part 3-2000, Cabling, Bracing, Guying of Established Trees;
 5. Part 4-2002, Lightning Protection Systems;
 6. ANSI Z133.1 – 1994 and most recent updates, Tree Care Operations – Safety Requirements
- D. Fertilizer and pesticide will be applied in strict accordance with the manufacturers label instructions and applicable federal, state, and local requirements. Fertilizer, soil conditioners, and pesticide applications must be approved by the owner prior to application. Safety Data Sheets (SDS) will be available for fertilizers and pesticides in the Contract Arborists' possession while on the site.
- E. Pre-Construction Meeting: Conduct meeting at the project site prior to commencement of construction related activities.
1. Contract Arborist, Project Arborist, Project Design Team, Owner and Contractors shall attend.
 2. Review methods and procedures related to tree protection and preservation including, but not limited to, the following:
 - a. Site Logistics Plan
 - b. Construction schedule – verify availability of material, personnel, and equipment needed to make progress and avoid delays.
 - c. Enforcement of requirements for tree protection areas.
 - d. Responsibilities of all parties, including coordination, access and timing requirements.
 - e. Field quality control

1.6 PROJECT CONDITIONS

- A. The following practices are prohibited within all tree protection areas except as specifically indicated herein:
1. Storage or stockpiling of construction materials, chemicals, debris, or excavation materials.
 2. Parking vehicles, trailers or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment or discharge of water.
 6. Excavation or other hand or mechanical digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary Tree Protection Fence

1. Chain-Link Fence: Follow requirements on fencing outlined in 01-5000 Temporary Facilities and in 01-1000 Summary.

B. Wood Chip Mulch

1. Double ground hardwood, aged a minimum 6 months from production, free from deleterious materials. Green chips or mulch not aged at least 6 months shall not be used. No walnut mulch shall be used. Submittal shall include original material source(s), number and type of grindings / chippings, duration of aging, timing of turning / aeration.

C. Hardwood Destruction Borer / Beetle Control: Bifenthrin, such as Onyx or equivalent. Applied per label.

D. Tree Growth Regulator (*Paclobutrazol*)

1. Paclobutrazol is a compound used to regulate plant growth in such a way as to restrict canopy growth and free stored or produced energy for other uses in the tree. For highly impacted trees, this means more energy may be made available for fibrous root growth (to combat root loss), thicker darker leaves (allowing for increased photosynthesis, and increased drought tolerance), and pest suppression (often an issue with construction stressed trees); among countless other potential benefits. Trade name Cambistat® or equal.

E. Soil Care/Soil Amendments

1. Fertilizer and soil amendment selection shall be based upon soil test results and recommendations.

PART 3 - EXECUTION

3.1 TREE REMOVAL

- A. See Section on Demolition for specifics on tree shrub or hedge removal.

3.2 TREE PROTECTION AND STRESS REDUCTION MEASURES

A. General

1. Installation/implementation of the following measures shall be performed in the field by and ISA Certified Arborist as provided by the Contract Arborist

2. All work, substitutions and /or modifications shall be subject to review and approval by the Owner.
 3. All work shall conform to applicable federal, state and local regulations and industry standards.
 4. The Contract Arborist shall be responsible for all items in this section.
- B. Coordination of Tree preservation plan. The work of the Contract Arborist coordination to include but not limited to the following:
1. Existing underground utility marker conflicts brought to the attention of the Contractor for resolution as well uncovered underground utilities as a result of work.
 2. Coordinate necessary survey layout of proposed construction elements in order to provide accurate locations for tree protection measures.
 3. Layout location of designated tree protection based upon proposed construction and methods of construction for that area.
 4. Site walk with Owner and Site Superintendent to verify location of all tree protection measures prior to execution.
 5. Notify Site Superintendent and Owner if construction adjacent to tree protection does not appear to follow specifications or prior agreement or conflicts with tree protection seem eminent.
 6. Coordinate with Site Superintendent and Owner, for access of deliveries, crews, equipment, start up, and cleanup of each item of work.
 7. Provide “as built” of any change to location of tree protection.
 8. Attend progress meetings as requested.
 9. Provide submittals as required.
 10. Notify Superintendent and Owner of any breach or damage to tree protection requiring attention.
- C. Pruning and Supportive Cabling
1. Specific canopy pruning for tree health, risk reduction, and construction clearance per Contract documents
 2. Size, health, species, and impact from proposed construction will be taken into consideration in determining pruning type for each designated tree. Risk Reduction Pruning will remove dead, dying, and declining limbs 2” diameter and larger. No interior green branching including sprouts will be removed unless approved by Contract Arborist.
 3. Contractor, Contract Arborist, and Owner shall meet at site to determine overhead clearance conflicts between trees and construction equipment/activities to prevent breakage, impacts, or aesthetic concerns. All work shall conform to ANSI A-300

arboriculture standards. An aerial assessment shall be made for all trees climbed to report any structural weakness of concern to the Owner.

4. Prior to climbing any tree a risk assessment will be performed using visual, sounding, or basic drilling as needed by the Contract Arborist. Trees deemed high risk should not be climbed; alternate methods should be used and the tree reported to the Owner immediately.
5. Supportive Cabling of weak unions may be recommended by the Contract Arborist if the need is discovered during pruning operations. ANSI Standards apply. Cabling may be included only if submitted to the Engineer and approved by the Owner.

D. Root Prune

1. Purpose of the root pruning is to provide a more suitable cut so as to not rip or tear roots during excavations and grading with standard construction equipment. The exact location and depth along the LOD or edge of utility excavation will be determined during the layout by a Certified Arborist.
2. Root Pruning for urban sites with specimen trees or for transplanting requires the use of SSAT excavation for hand pruning. Refer to SSAT specifications in the section
3. Sufficient moisture is necessary for reducing the level of dust, increase work efficiency, and provide a hospitable environment of the tree roots and pedestrians.
4. At a pre-work site inspection by the Contract Arborist more than 72 hours in advance of work start, subsurface probing to 24-36" with a tile probe or similar method will determine if sufficient soil moisture exists. If sufficient moisture is not found, immediate coordination with the site managers shall be made to irrigate the proposed work areas. Methodology may be soaker hose, sprinklers, soaker cans with small drilled holes to release water slowly or other methods. A second follow up inspection shall be made to determine final sufficiency to begin.
5. All root pruning operations shall be performed by the Contract Arborist and directed in the field by and ISA Certified Arborist with documented experience in similar SSAT excavation and root pruning.

E. Temporary Tree Protection Fence

1. Type and placement of fence to be designated on the Preservation Plans and Details.
2. Attach tree protection area signs at 30' feet spacing, facing construction activity. For fence lower than 6' feet in height, attach owner provided flagging as directed. Consult with the Owner for sign content.
3. Tree protection area signs shall be high visibility and all weather to last duration of the project / phase.
4. Install tree protection after root pruning if shown, and prior to all other mobilization such as demolition, clearing and/or excavation.

5. Install tree protection at 6" – 12" outside (construction side) of the Root Prune line or within the Root Prune Trench.
6. Silt fence will be outside (construction side) the tree protection fence, unless super silt fence is used in lieu of tree protection. Trenchless installation method shall be employed per Detail if Root Protection Matting is designated.
7. Exact placement of fence will be determined in walk-through with Contractor, Project Arborist, Contract Arborist, Engineer, and Owner.
8. Sequencing of the tree protection fence will be determined during the initial site walk. In any case, no construction activities shall occur in each phase or section until approved protection is installed.

F. Hand Excavation within Tree Protection Areas

1. For excavation within the critical root zone areas of trees to remain, the intent is to minimize tree and root damage from excavation activities.
2. Excavation shall be performed using SSAT, hand tools (shovels, etc.), or other approved non-damaging method. Roots shall not be damaged by the excavation except for approved root pruning.
3. Refer to "Supersonic Airtool Excavation" and "Construction Oversight by Arborist" specifications in this section for additional requirements.
4. All work shall be directly supervised by Contract Arborist in collaboration with the Owner's trades and subcontractors.
5. RPM (Root Protection Matting) shall be installed along trench sides to allow for temporary soil stockpile and access.
6. Excavate along the edge of the proposed trench closest to the trees to be protected as shown on the plans. Roots shall be uncovered and care taken to avoid damage to roots and bark.
7. Contract Arborist shall prune the exposed roots. Excavation shall not extend beyond the line where roots were pruned.
8. Contractor may proceed with conventional excavation methods or with hand excavation methods if clearance to the tree is inadequate for equipment access.
9. No roots shall be cut by the contractor.

G. Supersonic Airtool (SSAT) Excavation

1. Refer to "Hand Excavation within Tree Protection Areas" specification in this section for additional requirements
2. At a minimum, all SSAT work shall include the use of a barrier system such as temporary walls or tents to protect property and pedestrians from flying debris.

3. Excavate along the edge of the proposed trench closest to the trees to be protected as shown on the plans. Roots shall be uncovered and care taken to avoid damage to roots and bark.
4. Excavation shall proceed per the “Hand Excavation within Tree Protection Areas” specification in this section.

H. Wood Chip Mulch

1. Mulching for the duration of construction for protection and stress reduction. Mulching will increase moisture-holding capacity, minimize soil compaction, and increase needed organic composition. Mulch shall meet the specifications and shall be three (3) inches in depth.
2. For individual trees designated on the TPAK within the TPS or curvilinear TPA install mulch to a radius equal to trunk diameter inches equated to mulch ring diameter in feet (24” inch trunk diameter = 24’ feet diameter mulch ring). Where planting pit areas are restricted by hardscape, mulch the greatest area possible.
3. For privately owned trees, any installation is contingent upon receipt of owner’s permission. Owner may decline.
4. For linear TPAs along LOD Install mulch strips a minimum 10’ feet wide the length of critical root zones along the outside of the LOD/Root Prune line (just inside the Tree Protection Zone) for designated significant trees impacted by proposed construction.
5. Motorized equipment shall not enter the Tree Protection Area (TPA) unless specifically approved by the Project Arborist and specific conditions met (RPM, AlturnaMATS, etc.). Any such motorized equipment shall be operated by a certified arborist while inside the TPA.
6. Do not allow mulch to contact trunk / roof flare.
7. Mulch depth shall be 3” inches.

I. Tree Growth Regulator (*Paclobutrazol*)

1. Paclobutrazol is a compound used to regulate plant growth in such a way as to restrict canopy growth and free stored or produced energy for other uses in the tree. For highly impacted trees, this means more energy may be made available for fibrous root growth (to combat root loss), thicker darker leaves allowing for increased photosynthesis, and increased drought tolerance.
2. Specific methods and dosages are contained on the label and are determined by size and species, and applied by a state licensed pesticide applicator. Designated trees are shown on the Tree Protection Action Key (TPAK).

J. Supplemental Watering

1. This action is for high impact trees of significance during seasonal drought times of project construction. Based upon the number and size of trees various strategies can be

considered to maintain adequate soil moisture during these times. These strategies may include but are not limited to the following:

- a. Fire hydrant connection battery powered timer and drip irrigation hose/tubing;
 - b. Water tank truck and hand applied as directed;
 - c. Temporary above grade poly tank with battery-powered timers for drip or soaker hoses at each TPA.
 - d. 30-50 gallon watering cans with 6 – 8 drilled holes in bottom to allow slow seeping of water; spacing and rotation to reach desired gallons. Equivalent means of affectively watering trees as approved by Engineer or Project Arborist.
2. Trees requiring this treatment are indicated in the TPAK. Other trees will not receive this treatment.
 3. Drought times shall be defined as:
 - a. Periods during the growing season of two weeks or longer, where daytime high temperatures reach 80 degrees Fahrenheit or higher and less than ¼” rainfall are recorded per week. Or,
 - b. Periods during the growing season designated as “abnormally dry” or “drought” of any severity, by the U.S. Drought Monitor: <http://droughtmonitor.unl.edu/> Or,
 - c. Any period of extraordinary circumstance, as determined by the project arborist or engineer
 4. A prescription for the number of gallons and strategy for watering designated trees will be developed. Large mature trees with impacts to root systems require as much as 100 – 250 gallons per week during 90 degree days during summer drought times.
 5. Periodic inspections by an ISA Certified Arborist (provided by the Contract Arborist) as this time are critical. Depth of moisture in soils shall be determined by soil sample tube or other exploratory means.
 6. Minimum watering shall be considered to be 6 applications per growing season typically July through October with the exact timing and duration to be determined by the ISA Arborist.

K. Overhead Clearance

1. Trees to remain shall be assessed prior to construction for overhead clearance for construction activities. Contract Arborist shall recommend either canopy pruning, temporary guying/tying of select limbs, or alternative construction methods.
2. Pruning for clearance shall not remove branches above 12’ feet or over 6” inches diameter
3. All pruning proposed by the Contractor and / or Contract Arborist shall first be reviewed and approved by the Owner and Project Arborist.
4. Equipment exhaust should be directed away from trees as much as possible. Stationary equipment shall not exhaust directly under or toward trees.
5. Contractor shall use appropriate equipment near trees to ensure that trees are not damaged by construction. Contractor shall provide any specialized equipment needed at no additional cost to the owner.

6. Any pruning shall also conform to the pruning specifications in this section.

L. Soil Tests and Soil Care/Fertilization

1. Initial soil testing within tree protection areas is required. Conduct individual soil tests for separate tree protection areas (small adjacent areas may be tested together). Soil test shall be a representative sample from each area. Soil testing shall include a texture analysis (sand, silt, and clay percentages), soluble salts, and sodium tests.
2. Treatments to the tree protection areas for specified trees (see TPAK) shall be based on the results of the soil analysis. Fertilization should be consistent with the recommendations of the ANSI A-300 (Part 2) Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Fertilization) 2004, except as described herein.
3. Application rates shall not exceed a rate of 1 pound of actual nitrogen per 1,000 square feet annually. Fertilizer used should include humic acids, soluble seaweed extracts and soil biological inoculants (mycorrhizae, etc.).
4. Applications to confined areas (i.e. street tree planting pits) should be made by soil injection. In areas where adequate application rates cannot be achieved, injection should be made to the point of refusal.

3.3 FIELD QUALITY CONTROL AND MONITORING

A. Tree Condition Monitoring

1. An ISA Certified Arborist (provided by the Contract Arborist) shall perform monitoring twice per month year round to monitor insects, disease, soil moisture levels, weather, and health changes on all trees designated on Tree Protection Action Key.
2. The monitoring will include a report that details problematic areas that have been addressed, treatments provided to reduce the problem, and anticipated treatments forecast for 30 days. This report will be forwarded to the Project Arborist, Engineer and Owner for documentation.
3. Any treatments recommended by the Contract Arborist not already included in the project scope shall be noted in the reports for review by the Project Arborist, Engineer and Owner. No additional work is to be performed unless approved in writing by the Owner.

B. Construction Oversight by Contract Arborist

1. Any work within CRZs of retained trees shall be directly supervised by the Contract Arborist.
2. If roots are encountered during excavation, work shall progress as directed by the Contract Arborist. Contract Arborist, in coordination with the construction and design teams, shall determine appropriate means and methods to address the roots. Options may include, but not be limited to, severing the roots, hand or SSAT excavation. Contractor shall not cut roots.

3. Refer to “Hand Excavation within Tree Protection Areas” specification in the section.
4. All work shall be documented thoroughly, including photo documentation. Refer to site documentation submittal requirements.

3.4 CONTRACTOR DAMAGE AND PENALTIES

A. Remedial Measures

1. Any damage caused to the trees by the work of this contract through negligence by the contractor shall be immediately remedied by the contractor. Contractor shall be responsible for any associated costs.
2. Remedial work may include pruning, cabling, or any other measures up to and including removal and replacement, as determined by the Project Arborist and Engineer.
3. Remedial work shall be performed by the Contract Arborist, as approved by the Project Arborist and Engineer.
4. All required remedial work shall be performed to the satisfaction of the Project Arborist and Engineer, at no additional cost to the owner.

B. Tree Replacement

1. If damage to any tree is severe, because of negligence by the contractor as determined by the Project Arborist and Engineer, it shall be replaced with a new tree of equal size caliper and species as that of the damaged tree.
2. If a replacement tree of equal size and caliper is not possible as determined by the Project Arborist and Engineer, it shall be replaced on and inch by inch basis with new trees of a minimum caliper size of 2”-3”.
3. Replacement trees shall be supplied and installed at no additional costs to the owner, including all incidental costs including the costs of inspection of the tree at the nursery and any other incidental costs associated with tree replacement.

END OF SECTION 01-5640

SECTION 01-5719 - TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.

Environmental pollution and damage are defined as the presence of chemical, physical, or biological elements or agents which impact human health and the environment:

Adversely affect human health or welfare,

Unfavorably alter ecological balances of importance to human life,

Effect other species of importance to humankind, or;

Degrade the utility of the environment for aesthetic, cultural, and historical purposes.

Definitions of Pollutants:

Air: The presence on the ambient air of one or more air pollutants (e.g., dust, fumes, mist, smoke, particulate matter) in such quantities as likely to be injurious to the environment, to health of human, plant or animal life or to property

Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.

Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.

Sediment: Soil and other debris that has been eroded and transported by runoff water.

Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.

Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "water of the United States" and would require a permit to discharge water from the governing agency.

Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.

Sanitary Wastes:

- a. Sewage: Domestic sanitary sewage and human and animal waste.
- b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2 QUALITY CONTROL

Establish and maintain quality control for the environmental protection of all items set forth herein.

Record on daily reports any problems in complying with laws, regulations, and ordinances. Note any corrective action taken.

1.3 SUBMITTALS

In accordance with Section, 3300, SUBMITTAL PROCEDURES, furnish the following:

- A. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, the Contractor shall meet with the Engineer and Owner to discuss the implementation of the sedimentation and erosion control plan found in the contract drawings and to develop mutual understanding relative to details of that plan. The Contractor shall prepare and submit to the Engineer and Owner for approval as outlined in section 3100 Project Management and Controls, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
- a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan and the CT Department of Energy and Environmental Protections General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities (if applicable)
 - b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site.
 - c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
 - d. Name(s) and qualifications of person(s) responsible for conducting routine sedimentation and erosion control inspections, and their qualifications.
 - e. Description of the Contractor's environmental protection personnel training program.
 - f. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
 - g. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
 - h. Permits, licenses, and the location of the solid waste disposal area and recycling centers, if applicable.
 - i. Any alterations to the sedimentation and erosion control drawings and/or Environmental Plan including but not limited to showing locations of any haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.

Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of their responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.4 PROTECTION OF ENVIRONMENTAL RESOURCES

Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.

A. Protection of Air Quality:

All Contractors, diesel powered on-road and off-road construction equipment used on site during the course of the project shall meet the following:

- a. On-road and off-road construction vehicles shall not operate for more than three (3) consecutive minutes and no longer than five (5) total minutes in any 60-minute period when the vehicles are not in motion. Exceptions are made for weather extremes, health and safety and certain operational conditions set forth in Regulations of Connecticut State Agencies (RCSA) Section 22a-174-18(b)(3)(C).
- b. Contractors shall implement and track a preventative maintenance plan for all equipment according to the engine manufactures specifications.
- c. The use of ultra-low sulfur diesel fuel (less than or equal to 15 ppm sulfur content as defined by ASTM) shall be used for all diesel powered construction equipment.
- d. 50 percent of all construction equipment runtime shall be based on using equipment that has an U.S. Environmental Protection Agency (EPA) compliance rating of Tier 2 or higher. All equipment shall have a minimum compliance rating of Tier 1. Contractors can retrofit older equipment with diesel oxidation catalysts or particulate filters to meet EPA Tier standards. In addition, all motor vehicles and/or construction equipment (both on-road and off-road) shall comply with all pertinent State and Federal regulations relative to exhaust emission controls and safety.
- e. The Contractor or Construction Manager, in conjunction with the Subcontractors shall at least monthly record the following and provide upon request to the Owner's representative the following:
 - a) Make, Model and Year of all equipment
 - b) Tier Rating of each piece of equipment
 - c) Run Time of each piece of equipment
 - d) Calculation of percentage of runtime per tier of equipment
 - e) Fuel purchasing records
 - f) Equipment maintained plan demonstrating equipment maintenance is per manufactures recommendations.
 - g) Enforcement records of idle reduction policy.
- f. All Work shall be conducted to ensure that no harmful effects are caused to adjacent Sensitive Receptor Sites. When placing heavy equipment and accepting deliveries, diesel powered engines shall be located away from fresh air intakes, air conditioners, entry ways and operative windows.

If any diesel powered on-road and off-road construction equipment is found to be in non-compliance with these provisions by the Owner's Project Manager, the Contractor or Construction Manager will be issued a notice with an immediate right to cure within five (5) minutes of receipt for idling vehicles and equipment, twelve (12) hour period of receipt for moving cranes and twenty four (24) hour of receipt in which to bring the equipment not retrofitted into compliance or remove it from the Project. The Contractor or Construction Manager failure to comply with

these provisions shall be reason to withhold payment or terminate the contract as prescribed within the contract documents.

Any costs associated with these provisions shall be included in the general cost of the contract. In addition, there shall be no time granted to the Contractor or Construction Manager for compliance with these provisions. The Contractor or Construction Manager compliance with these provisions and any associated regulations shall not be grounds for a Change Order.

The Contractor or Construction Manager may request a waiver to all or portions of these provisions with written justification to the Project Manager as to why the Contractor, Construction Manager or Subcontractor cannot comply with these provisions. A waiver, to be effective, must be granted in writing by the Owner's Representative.

B. Equipment and Vehicles

Contractor shall review construction vehicle and equipment exhaust outlets in relationship to existing plant material with Owner. If exhaust is directed at existing plant material the placement of the equipment shall be altered or the exhaust outlet shall be altered by use of flexible exhaust pipe or other approved method. All efforts shall be made to protect plant material from direct exhaust outlets.

Engine braking or exhaust braking shall be prohibited on campus roads and surrounding state roads leading to any campus.

C. Protection of Land Resources:

Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Resident Engineer. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.

Work Area Limits: Include within the Site Logistics Plan and prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.

Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.

- a. Box and protect from damage existing trees and shrubs to remain on the construction site.
- b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
- c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.

D. Protection of Water Resources:

Sedimentation and Erosion Control (E&S) measures are required for all projects involving earthwork to prevent the movement of sediments off construction sites into nearby water bodies by implementing sedimentation and erosion controls. For projects greater than 1 acres of land disturbance, the City may obtain a General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities.

Contractor must adhere to all requirements of any permit(s) under this project, including but not limited to General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities (Construction GP) Notable requirements include:

- a. Follow the erosion control plan and stormwater pollution prevention plan (if applicable) contained in the project documents;
- b. Inspect E&S per the requirements in the construction GP;
- c. Perform turbidity sampling per the requirements in the construction GP and submit the results to the CTDEEP (if applicable);
- d. Minimize dust;
- e. Maintain all controls such as silt fence, anti-tracking pads, and catch basin silt sacks;
- f. The dumping of liquids in the storm sewer is prohibited.
- g. All post-construction stormwater structures shall be cleaned of sediments and any remaining silt fence and silt sacks shall be removed upon stabilization of the project's site soils.

E. Waste Disposal:

Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment.

- a. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
- b. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
- c. Handle discarded materials other than those included in the solid waste category as directed by the Resident Engineer.

F. Protection of Air Resources:

Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of Connecticut Department of Energy and Environmental Protection (CTDEEP) air regulations and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.

- a. Control of Particulate Matter and Visible Emissions
(Regulations of Connecticut State Agencies (RCSA) § 22a-174-18):
- b. Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.

- c. Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Spraying chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
- d. Control of Organic Compound Emissions (RCSA § 22a-174-20): Control organic compound emissions from equipment to applicable State allowable limits.
- e. Control of Odors (RCSA § 22a-174-23): Control odors of construction activities and prevent obnoxious odors from occurring.

G. Reduction of Noise:

Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Resident Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified.

H. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 5:00 p.m unless otherwise permitted by local ordinance or the Owner. Repetitive impact noise on the property shall not exceed the following dB limitations:

| <u>Time Duration of Impact Noise</u> | <u>Sound Level in dB</u> |
|--------------------------------------|--------------------------|
| More than 12 minutes in any hour | 70 |
| Less than 30 seconds of any hour | 85 |
| Less than three minutes of any hour | 80 |
| Less than 12 minutes of any hour | 75 |

Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:

- d. Use shields or other physical barriers to restrict noise transmission.
- e. Provide soundproof housings or enclosures for noise-producing machinery.
- f. Use efficient silencers on equipment air intakes.
- g. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
- h. Line hoppers and storage bins with sound deadening material.
- i. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.

3. Measure sound level for noise exposure due to the construction at least once every five successive days while work is being performed above 75 dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face. Submit the recorded information to the Resident Engineer noting any problems and the alternatives for mitigating actions.

Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to Owner and Engineer requirements. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, all debris and rubbish resulting from demolition and new work operations and removal of all “call before you dig markings” placed on behalf of the project, regardless if the Contractor marked or called to mark the location.

END OF SECTION 01-5719

SECTION 01-6000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Division 01 Section "Allowances" for products selected under an allowance.
 - 2. Division 01 Section "Alternates" for products selected under an alternate.
 - 3. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in Division One Section "Substitutions".
 - 2. Engineer's Action: Review action shall follow all requirements specified in Division One Sections on "Substitutions" and "Submittals".
 - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - b. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Engineer will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:

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

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. **Manufacturer's Warranty:** Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. **Special Warranty:** Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for execution.
1. **Manufacturer's Standard Form:** Modified to include Project-specific information and properly executed.
 2. **Specified Form:** When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. **Submittal Time:** Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. **General Product Requirements:** Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. **Standard Products:** If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Engineer will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations and not by previous Project experience. Procedures governing product selection include the following:
1. Proprietary Specification Requirements: Where Specifications name only a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Semi proprietary Specification Requirements: Where Specifications name three or more products or manufacturers, provide one of the products indicated. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 3. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
 5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
 - a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
 6. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable

Products" Article for consideration of an unnamed product by one of the other named manufacturers.

7. Visual Matching Specification: Where Specifications require "match Engineer's sample", provide a product that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.
8. Visual Selection Specification: Where Specifications include the phrase "as selected by Engineer from manufacturer's full range" or similar phrase, select a product that complies with requirements. Engineer will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
9. Allowances: Refer to individual Specification Sections and provisions in Section 01-2100, Allowances, for allowances that control product selection, and for procedures required for processing such selections.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with these requirements:
 1. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Proposed changes are in keeping with the intent of Contract Documents.
 3. The request is timely, fully documented and properly submitted.
 4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
 5. The specified product or method of construction cannot be provided within the Contract Time.
 - a. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly, coordinate activities properly or to adhere with the sequence of work within the contract schedule.
 6. The specified product or method of construction cannot receive necessary approval by a governing authority.
 7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deduction offsetting responsibilities the Owner may be required to bear.
 - a. Additional responsibilities for the Owner may include additional compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.
 8. The specified product or method of construction cannot be provided in a manner that is compatible with other material, and where the Contractor certifies that the comparable product will overcome the incompatibility.

9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed comparable product can be coordinated.
 10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed comparable product provide the required warranty.
 11. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 12. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners, if requested.
 13. Samples, if requested.
- B. The Contractor's submittal and Engineer's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid submittal, nor does it constitute approval.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS:

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work.
1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01-6000

SECTION 01-7300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

- B. Related Requirements:

1. Division 01 Section "Summary" for limits on use of Project site.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Division 02 Section "Selective Structure Demolition" for demolition and removal of selected portions of the building.
5. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- B. Cutting and Patching Plan: Submit plan describing procedures at least fourteen (14) days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying and GIS services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Engineer of locations and details of cutting and await directions from Engineer before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety
 - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner

that would, in Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades for review of plan. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in sustainable design requirement Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. And coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Verification of measurements and locations shall be performed by a licensed surveyor who will collect the GIS coordinates that will be included in the final as-built documentation.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Engineer according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish limits on use of Project site.
 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 4. Inform installers of lines and levels to which they must comply.
 5. Check the location, level and plumb, of every major element as the Work progresses.
 6. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Owner. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Owner before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Document slope and locations of material and product below and above ground on all utilities. Such documentation shall be performed by a licensed surveyor who will collect the GIS coordinates that will be included in the final as-built documentation.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels or create high vibrations.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect as approved by the Engineer. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Division 01 Section "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

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

preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
 - 5. Follow all Owner sustainable design requirements, not limited to LEED.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove of non-hazardous liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Construction Waste Management and Disposal.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

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

END OF SECTION 01-7300

SECTION 01-7700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warrantee Requirements
 - 4. Submittal of Warranties.
 - 5. Revenue Services Requirements
 - 6. Final cleaning.
 - 7. Repair of the Work.
- B. Related Requirements:
 - 1. Division 01 Section "Execution" for progress cleaning of Project site.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel
 - 5. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- A. Review list of Owner requirements as conditions for meeting substantial completion.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
 - 1. Contractor's punch list shall be complete and shall cover the entire contract scope, unless previously identified within the contract documents that the project will be completed in phases.
 - 2. Upon receipt of Contractor's punch list of incomplete items, depending on the amount of remaining finish work, Engineer may begin generating their own punch list. If the Engineer determines that the Contractor's punch list is significantly deficient or contains a significant amount of unfinished work to meet substantial completion, Engineer will formally notify the Contractor accordingly with no further action. Contractor shall continue to complete unfinished work until the Engineer determines that Substantial Completion has been met.
 - 3. Any time and expenses incurred by the Engineer to re-review completeness of Contractor's work to determine Substantial Completion has been met, shall be at the Contractor's expense,
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 14 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including but not limited to project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property coordinate mapping surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Labels must clearly identify what the maintenance material is for what piece equipment, with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner signature for receipt of submittals.

5. Submit a statement that all air flush-out procedures were performed. Include process used and dates when flush-out was started and completed. Filtration media must be replaced after flush-out process was completed. If procedure was performed prior to dust creating work was complete, Contractor must perform an additional process.
 6. Submit test/adjust/balance records.
 7. Submit systems curves for air and water systems,
 8. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 14 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform air flush-out procedures and replace filtration media after flush-out of the building's systems. Replace all filters.
 5. Perform adjustments and balancing of systems, provide reports
 6. Perform preventive maintenance on equipment and systems used prior to Substantial Completion, regardless if the equipment was existing. Advise Owner of changeover in heat and other utilities.
 7. Conduct inspection and walkthrough with local authorities having jurisdiction.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Remove temporary fencing.
 - a. Power wash all Owner supplied scrim. Let dry and neatly roll/fold scrim and deliver to Owner's designated storage location.
 10. Complete final cleaning requirements, including touchup painting.
 11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 12. Provide as-built documentation of changes made in the field or in cases where no field changes occurred, certified statement from the trade contractor documenting such.
 - a. Contractor shall remain responsible for costs that may occur should existing conditions be found that are not reflected within the as-built documents provided for closeout.
 13. All surveys and survey information as outlined within quality control of Division One.
 - a. Should the Contractor fail during the course of the work to have licensed survey of required coordinate points and document information outlined within the contract documents, Owner shall have such work performed by others, at the Contractors expense.
 - 14.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 14 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings as specified in Division 01 Section "Demonstration and Training."
 2. Submit a final Application for Payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 3. Submit an updated final Application for Payment statement, accounting for final additional charges to the Contract Sum.
 4. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 5. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 6. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.
 7. Submit consent of surety to final payment.
 8. Submit a final liquidated damages settlement statement.
 9. Any attic stock that has been outlined to be provided, shall be acknowledged as received by the Owner. Copy of transmittal listing the material/parts and quantities with Owner signature of acceptance.
 10. Pest control inspections and warranty
 11. Construction progress photographs
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 14 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when all the Work identified in previous inspections as incomplete is completed or corrected.
 2. Upon completion of reinspection, the Owner with advice of the Engineer will prepare a Certificate of Final Acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 3. If necessary, reinspection will be repeated at the Contractor's expense.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format or format approved by Owner:
 - a. PDF electronic file. Engineer will return annotated file.

1.9 WARRANTY RESPONSE REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. All work shall be covered by the standard one (1) year guarantee as set forth in the General Conditions. The Contractor with his subcontractors shall visit the project site at 11 months into the guarantee period to determine with the Owner the scope of any required guarantee work. The Contractor shall contact the Owner and Engineer for scheduling so that the Owner and Engineer can attend.
- C. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- D. Specific requirements for warranties for the Work and products and installations that are specified to be warrantee are included in the individual Sections of Divisions 2 through 33.
- E. Disclaimers and limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- F. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 - 1. Organize based on the format outlined within the Owners closeout check list. Provide two hardcopies complete draft for AE reviews. Submit one final electronic document as final.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name and number, and name of Contractor.
 - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document and contact information for each warrantee including extended warrantees Define distinct warrantee coverage and contact information for each warrantee.
 - 5. All required guarantees/warranties will be by the respective company made out to the Owner.
 - 6. All guarantees/warranties supplied by subcontractors or manufacturers shall be countersigned by the Contractor.
 - 7.
- G. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.11 REVENUE SERVICES REQUIREMENTS

- A. Upon receipt of the Certificate of Substantial Completion, the Contractor shall submit the following information required by the Connecticut Department of Revenue Services.
1. The identity and addresses of all subcontractors performing work on the project.
 2. The Connecticut tax registration numbers of the Contractor and all subcontractors.
 3. The Federal Social Security account numbers, or Federal Employer Identification numbers, or both, if applicable, for the General Contractor and all subcontractors.
 4. Include a copy of the transmittal sent to the Department of Revenue on project contacts information that is to be included within the closeout manual.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Clean catch basins affected by construction activities.
 - c. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - d. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - e. Remove tools, construction equipment, machinery, and surplus material from Project site.

- f. Remove snow and ice to provide safe access to building.
 - g. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Clean and polish tile and other glazed surfaces affected by construction activity.
 - l. Clean and polish finish hardware affected by construction activity.
 - m. Clean exposed surfaces of diffusers, registers, and grills affected by construction activity.
 - n. Replace all filters of equipment and systems used during construction.
 - o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency that were affected by construction activity.
 - p. Leave Project clean and ready for occupancy.
 - q. Remove all sediment control for catch basins and fully clean out catch basin.
- C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare written report.
- D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
- E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
- 1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

3.3 CERTIFICATIONS

- A. The Contractor, at completion of construction, shall provide to the Owner on company letter head a "Certificate of Substantial Compliance" bearing original signatures of an officer of the company reflecting the following:
1. Address to: City of Hartford
 2. Identify the Project number and Project Name;
 3. Project's Description of work: As represented within Division 01 Section 1000 Summary.
 4. Certification Statement:

I, the undersigned, am the official authorized agent to execute contracts on behalf of (insert official legal name of contracting Company). I certify that (insert official legal name of contracting Company) pursuant to the statutory and contractual requirements applied to this Project, CERTIFY that, in my professional opinion, the complete structure/renovations described above is in substantial compliance with the approved construction documents on file with the City of Hartford. Minor deviations and special stipulations are noted below (if any, list)".

The above statement is Sworn as True to the best of my knowledge and belief, subject to the penalties of false statement.

5. Print Name of the Authorized Agent:
6. Provide signature of the Authorized Agent:
7. Date:
8. Subscribed and acknowledged before me this day of , 20 .
9. Notary Seal and signature.

- B. The Contractor, at completion of construction, shall provide to the Owner on company letter head bearing original signatures of an officer of the company certifying that they will maintain required insurance coverage. Such document shall reflect the following:
1. Address to: City of Hartford
 2. Identify the Project number and Project Name;
 3. Project's Description of work: As represented within Division 01 Section 1000 Summary.
 4. Certification Statement:

I, the undersigned, am the official authorized agent to execute contracts on behalf of (insert official legal name of contracting Company). I certify that (insert official legal

name of contracting Company) pursuant to the statutory and contractual requirements applied to this Project, shall maintain the contractually required insurance coverage and limits for a period of no less than three (3) years after final payment and final completion of the work.

The above statement is Sworn as True to the best of my knowledge and belief, subject to the penalties of false statement.

5. Print Name of the Authorized Agent
6. Provide Signature of the Authorized Agent
7. Date:
8. Subscribed and acknowledged before me this day of , 20 .
9. Notary Seal and signature.

- C. Prior to Owners' approval and acceptance, mechanical and electrical systems shall be fully commissioned by the Contractor. and Commissioning Agent (when applicable) and is efficiently operational.

PART 4 - SCHEDULES

4.1 SCHEDULE OF WARRANTIES

- A. Schedule: Provide warranties and bonds on products and installations as specified in the technical specifications.

END OF SECTION 01-7700

SECTION 01-7823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency procedures and contacts.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance and warranty manuals.
- B. Related Requirements:
 - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

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

1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Engineer will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

- B. Format: Submit operations and maintenance manuals in the following format:
1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Engineer.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 2. One paper copy, separately bound. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- C. Initial Manual Submittal: Submit two draft copies of the manual at least 30 days before commencing demonstration and training. Engineer and Owner will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Engineer will return copy with comments.
1. Correct or revise the manual to comply with Engineer's and Owner's comments. Submit copy of corrected manual within 15 days of receipt of Engineer's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. Table of contents.
 2. List of all Subcontractors and Suppliers – name, address, contact and federal identification numbers.
 3. List of all drawings and their number and title, including all additions and deletions during the course of the project.
 4. List of specification section numbers and title.
 5. List all redlined as-built documents.
 6. List of systems.
 7. List of equipment.
 - 8.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for the emergency, operation, and maintenance manual.
- E. Updated List of Subcontractors and Suppliers: List all contractors, subcontractors, sub-tier subcontractors and suppliers who worked on or supplied material to the Project. Include name of the firm, firm's address, firm's contact person, contact phone number, Connecticut registration number and Federal employer identification number (FEIN),
- F. Identification: In the documentation directory and in the operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Project Number
 - 4. Name and address of Owner.
 - 5. Date of submittal.
 - 6. Name and contact information for Contractor.
 - 7. Name and contact information for Engineer.
 - 8. Name and contact information for Commissioning Authority, (if applicable).
 - 9. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
 - 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, scans shall be in color at 600dpi with searchable capabilities.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 5. Operations and Maintenance Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY PROCEDURES TO BE INCLUDED IN O&M MANUALS

- A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

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

1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

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

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

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

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

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Project record documents shall only be used as a supplement to the manufacturers documentation as part of operation and maintenance manuals.
 2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."
- G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01-7823

SECTION 01-7839 - PROJECT RECORDING DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting changes to the project contract documents, including the following:

- 1. Redlined Drawings.
- 2. Redlined Specifications.
- 3. Redlined Product Data.
- 4. Miscellaneous redlined submittals.
- 5. Measured As-built Drawings

- B. Related Requirements:

- 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
- 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
- 3. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

- A. Redlined Drawings: Comply with the following:

- 1. Number of Copies: Submit copies of Redlined Drawings as follows:

- a. Initial Submittal:

- 1) Submit one (1) paper-copy set of marked-up redlined prints.
- 2) Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

- b. Final Submittal:

- 1) Submit one (1) paper-copy set of marked-up redlined prints.
- 2) Print each drawing, whether or not changes and additional information were recorded.

- B. Redlined Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.
- C. Redlined Product Data: Submit one paper copy of each submittal.
 - 1. Redlined Product Data is required as part of operation and maintenance manuals. , Submit duplicate marked-up Product Data as a component of the manuals.
- D. Miscellaneous Redlined Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy of each submittal.
- E. Reports: Submit written reports indicating items incorporated into project redlined documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORDING CONTRACT DRAWING FIELD CHANGES

- A. Field Set Prints Upon receipt of a conformance set of contract documents from the Engineer, maintain one set of marked-up redlined paper copies of the Conformance Set Drawings and Conformance Set Specifications as the Field Set. Changes occurring during construction shall be documented in a single paper Field Set maintained in good order at the project site.
 - 1. Preparation: Mark field set prints to show where installation varies from that shown originally. Require individual or entity who document the change, whether installer, subcontractor, or similar entity, to provide information for corresponding marked-up redlined set of prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Record information in an acceptable drawing technique.
 - c. Record data as soon as possible but not later than one (1) week after the change has been completed.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference relinedprints to corresponding archive photographic documentation.
 - 2. Content: Types of items requiring redlined marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.

- g. Equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Diagrammatic flow changes and routings
 - k. Changes made by Change Order or Construction Change Directive.
 - l. Changes made following Engineer's ASIs, PRs, and Bulletins.
 - m. Details not on the original Contract Drawings.
 - n. Changes made by coordination drawings
 - o. Updates to any schedules including but not limited to: equipment schedules, lighting schedules, hardware schedules, security controls schedules,
 - p. Field conditions for variable and concealed conditions.
 - q. Record information on the Work that is shown only schematically.
- 3. Mark the Field Set Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of redlined prints.
 - 4. Mark field sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location, not limited to utilities.
 - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each redline drawing; include the designation "PROJECT REDLINE DRAWING" in a prominent location.
- 1. Redline Prints: Organize redline prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Engineer and or Construction Manager.
 - e. Name of Contractor.

2.2 REDLINE SPECIFICATIONS

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

5. Note related Change Orders and record Drawings where applicable.

B. Format: Submit Redline Specifications as paper copy.

2.3 REDLINED PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders] and Change Management Documents provided by the Engineer where applicable.

B. Format: Submit redlined Product Data as paper copy.

2.4 AS-BUILT SURVEY RECORDING DOCUMENTATION FOR ABOVEGROUND AND UNDERGROUND UTILITIES.

A. Preparation: Provide field survey through the services of a surveyor licensed in the State of Connecticut of each newly installed utility and exposed existing utility while performing the work.

1. Maintain one complete electronic As-Built Set of actual field locations of newly installed utilities and exposed existing utility. Such As-Built Set is to be kept current and must be delivered to the Owner both in electronic format (Adobe Pro PDF) and hard print as a condition of reaching completion and final payment on the Project.
2. Updates shall be continuous with progress recorded within one (1) week of the installation. Upon request Contractor shall provide hard print of surveys documented to date of newly installed utilities with all information as required. Such submission shall be a condition for approving progress payments.

B. Format: As-Built Set shall be submitted in AutoCAD 2014 and in a format as follows:

1. All information added to the base AutoCAD drawing shall be on layers starting with AB-XXXX (example, as built gas shall be on a drawing layer titled AB-GAS)
2. Surveyor shall utilize survey equipment able to locate infrastructure to a Utility Quality Level A as defined in the ASCE 38-02 Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.

C. Product Data: Utility measuring data to be provided shall be limited to the following data points:

1. Sanitary Sewer
 - a. Manhole: Horizontal Location, Rim and Invert Elevation
 - b. Pump Stations: Horizontal Location, Rim and Invert Elevation
 - c. Cleanout: Horizontal Location, Rim and Invert Elevation

- d. Gravity Pipe: Size, Material, Elevation at all changes in direction vertical or horizontal
 - e. Force Main: Size, Material, Elevation at all changes in direction vertical or horizontal and at every 50'.
 - f. Building Invert: Size, Material, Horizontal Location and Invert at face of building
2. Storm Sewer
- a. Inlet/Manhole: Horizontal Location, Rim and Invert Elevation
 - b. Cleanout: Horizontal Location, Rim and Invert Elevation
 - c. Gravity Pipe: Size, Material, Elevation at all changes in direction vertical or horizontal
 - d. Force Main: Size, Material, Elevation at all changes in direction vertical or horizontal and at every 50'.
 - e. Building Invert: Size, Material, Horizontal Location and Invert at face of building.
3. Water/Fire & Reclaimed Water
- a. Valves: Horizontal Location, Rim and Top of Valve (pipe) Elevation
 - b. Hydrants: Horizontal Location, Base Elevation
 - c. Piping: Size, Material, Elevation (Top of Pipe) at all changes in direction vertical or horizontal and at every 50'.
 - d. Building Lateral: Size, Material, Horizontal Location and Elevation (Top of Pipe) at face of building.
4. Steam, Condensate (All types) & Chilled Water
- a. Valves: Type, Horizontal Location, Rim and Top of Valve (pipe) Elevation
 - b. Vaults: Type, Horizontal Location, Rim & Bottom Structure Elevation, Location and Elevation of Outer Edges of Structure (Corners), Elevation of piping at face of vault (Top of Carrier Pipe)
 - c. Piping: Type, Size, Material, Elevation (Top of Carrier Pipe) at all changes in direction vertical or horizontal and at every 50'.
 - d. Building Lateral: Type, Size, Material, Horizontal Location and Elevation (Top of Carrier Pipe) at face of building.
 - e. Vent Structures: Horizontal Location, Rim and Top of Pipe Elevation
 - f. Vent Piping: Size, Material, Elevation (Top of Pipe) at all changes in direction vertical or horizontal.
5. Low Voltage & Medium Voltage Electrical (Including Site Lighting / BluePhones)
- a. Vaults/Manholes: Type, Horizontal Location, Rim & Bottom Structure Elevation, Location and Elevation of Outer Edges of Structure (Corners), Elevation and width of concrete and/or conduit at face of vault (Top of Concrete/Conduit(s))
 - b. Ductbank/Conduits: Type, Size, Quantity, Material, Elevation (Top of Concrete for encased in concrete / Conduit for direct bury) at all changes in direction vertical or horizontal and at every 50'.
 - c. Building Lateral: Type, Size, Quantity, Material, Elevation (Top of Concrete for encased in concrete / Conduit for direct bury) at face of building.
 - d. Site Lighting/BluePhone: Type, Horizontal Location, Elevation of concrete base.
6. Gas
- a. Valves: Horizontal Location, Rim and Top of Valve (pipe) Elevation

- b. Piping: Size, Material, Elevation (Top of Pipe) at all changes in direction vertical or horizontal and at every 50'.
- c. Building Lateral: Size, Material, Horizontal Location and Elevation (Top of Pipe) at face of building.

2.5 MISCELLANEOUS CHANGE RECORDING SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as paper copy.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

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

END OF SECTION 01-7839

SECTION 01-7900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
- B. Related Requirements:
 - 1. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 INFORMATIONAL SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

- C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
1. Inspect and discuss locations and other facilities required for instruction.
 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 3. Review required content of instruction.
 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

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

1.6 PRODUCTS

1.7 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 2. Documentation: Review the following items in detail:

- a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning

- e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 2 - EXECUTION

2.1 PREPARATION

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

2.2 INSTRUCTION

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

END OF SECTION 017900

SECTION 02 10 00

MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 - GENERAL

1.1 RELATED DOCUMENT

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

1.2 SUMMARY

- A. Provide all labor, materials, necessary equipment and services to complete the work called for in this Section or as shown on the plans, including but not necessarily limited to the following:
 - 1. All proposed construction signs and support posts required.
 - 2. Barricades, traffic cones, warning lights and protective safety fence as required to establish roadway closing and to protect open trenches.
 - 3. Protect pedestrian and vehicular traffic at all times on site. Provide flagmen as required.
 - 4. Scheduling of activities and deliveries to minimize impact to traffic. Access to site for construction and deliveries should be coordinated with school officials to avoid beginning and ending of school time periods.
 - 5. Installation of impact attenuation systems if required.
- B. Related Work: The following sections contain requirements that may apply to this section:
 - 1. Division 31, Section "Site Preparation and Demolition"
 - 2. Division 31, Section "Excavation and fill".
 - 3. Division 32, Section "Bituminous Asphalt Concrete Paving".

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All materials, barricades, cones, etc. shall conform to the requirements described in the State of Connecticut Department of Transportation Form 818 and standard D.O.T. procedures.

PART 3 - EXECUTION

3.1 GENERAL

- A. Protect from vehicular and pedestrian traffic during all operations. Construct all barricades, cones and safety fence as shown on the drawings or as directed by the Owner's Representative.
- B. All construction signs shall be constructed of Aluminum with a minimum thickness of 0.100 mils. All colors shall be reflectorized and shall conform to State of Connecticut Department of Transportation Form 818, Section 12.20.
- C. Sign supports - Wt./Ft. = 3 LB. and shall conform to Standard Connecticut sign mounting details.
- D. Construction barricades shall conform to State of Connecticut Department of Transportation Form 818, Section 9.79. Traffic cones and drums shall conform to Sections 9.77 and 9.78 of Form 818.
- E. The locating and or stockpiling of demolition material, construction material, construction equipment, machinery, supplies, vehicles, and materials, within any means of egress (exterior or interior) or any fire lane shall be PROHIBITED, no matter how temporary, without consultation with the Public Safety / Fire Marshall's office.
- F. Provide all signs, barricades, warning lights, and other appurtenances required to maintain traffic and access to parking areas as shown on the Plans.

END OF SECTION 02 10 00

SECTION 02 32 19

TEST PITS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work under this Section includes the excavation of exploratory test pits to determine or verify underground utility or structure locations or other purposes.
 - 1. Test pit excavation under this Section shall be made only where indicated on the Drawings or as ordered by the Engineer. Required pre-excavation of the trench as specified elsewhere herein shall not be considered as a test pit for the purposes of this Contract.
 - 2. The work shall include all necessary excavating, disposing of unused excavated material, refilling trenches, furnishing additional material for refilling, temporary paving, permanent surface restoration in non-paved areas, pumping and all incidental work except as otherwise provided for.
- B. This item of work is not intended for the general use of the Contractor to verify the location of underground utilities, structures or service connections for the work shown on the Contract Drawings. Any such work shall be included in the appropriate item for permanent works.

1.2 RELATED WORK

- A. Section 31 23 00, Excavation And Fill
- B. Section 31 41 00, Excavation Support System
- C. Section 31 23 19, Dewatering
- D. Section 32 12 16, Bituminous Asphalt Concrete Paving

PART 2 - PRODUCTS

2.1 BANK RUN GRAVEL AND OTHER SPECIAL TRENCH REFILL MATERIALS.

- A. Refer to Section 31 23 23, Site Backfill.

2.2 TEMPORARY PAVEMENT.

- A. Refer to Section 32 12 16, Bituminous Asphalt Concrete Paving

PART 3 - EXECUTION

3.1 GENERAL.

- A. Test pit excavations shall be made at locations shown on the Contract Drawings, as ordered by the Engineer and as specified below. The horizontal dimensions of the pit shall be as ordered by the Engineer.
 - a. The Contractor shall dig a test pit when a site element (i.e. drainage structure or lightpole foundation) is in potential conflict with a utility.
- B. The perimeter lines between existing pavement and/or sidewalks to be removed and existing pavement and/or sidewalks to remain shall be carefully cut to leave a smooth, straight and vertical edge. The methods used and the location of such cuts shall conform to the requirements and specifications of the authorities having jurisdiction. The pavement inside the perimeter lines shall be broken up and removed.
- C. Material shall be carefully excavated so that the underground utility or structure being searched for, or any other utility or structure, will not be damaged or destroyed. Excavation shall be with a hand shovel if conditions so warrant. Any utility or structure damaged or destroyed shall be replaced or repaired at no additional cost to the Owner.
- D. Support of the excavation and dewatering shall be sufficient to accomplish the purpose of the test pit and be in conformance, where required, with other applicable sections of these Specifications.
- E. The Contractor shall be responsible for having an on-site mark-out of all utilities in the area completed prior to digging a test pit in that area.
- F. Backfill where the material will be subsequently re-excavated as part of the work under this Contract:
 - 1. The test pit shall be backfilled with suitable bank run gravel material in accord with the requirements of Section 31 23 23.
 - 2. The pavement surface shall receive a temporary patch in accordance with Section 32 12 16.
- G. Backfill in areas that will not be subsequently re-excavated as part of the work under this Contract:
 - 1. The test pit shall be backfilled with suitable bank run gravel material as directed by the Engineer in accordance with Section 31 23 23.
 - 2. The pavement surface shall receive a temporary patch in accordance with Section 32 12 16.
 - 3. The pavement surface shall be permanently restored in accordance with Section 32 12 16.
 - 4. Where unpaved areas are disturbed in the course of test pit excavation, restoration shall be in accordance with Section 31 23 00, Section 32 91 19 and Section 32 92 00.

3.2 SERVICE CONNECTION OR UTILITY VERIFICATION.

- A. Tests may be carried out to verify the location and type of service connections or utilities or for other purposes as determined by the Engineer.
- B. Test pits at utility crossings shall be utilized to determine if the crossing can be made at the location indicated on the plans. If the crossing is to take place at a pipe joint in the utility, the location of the crossing shall be revised so that it will not occur at a joint as directed by the Engineer.

END SECTION 023219

SECTION 021 41 13

SITE PREPARATION AND DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

- A. Provide all labor, materials and equipment required to perform the work called for in this section of the Specification, or as shown on the drawings, including but not limited to the following:

- 1 Removal of all existing concrete and bituminous concrete from within the contract limit line or as directed.
- 2 The clearing of the ground of trees, stumps, brush, rubbish, and all objectionable material within the excavation, embankments and fill areas as indicated on the plans, or as directed.
- 3 Transplanting of trees as shown in the drawings.
- 4 Removal and relocation of boulders, signs as shown in the drawings..
- 5 Removal and relocation of timber guard rail as shown in the drawings and per Appendix C.
- 6 Clear site of plant life and grass as indicated on the Drawings and as necessary to complete the work.
- 7 Stripping and stockpiling of topsoil.
- 8 Remove root systems of trees and shrubs in areas cleared.
- 9 Removal of fences, signs and any additional items as shown on the plan, or as directed.
- 10 Installation of construction entrance pad.
- 11 Protection of all site elements to remain including but not limited to fences, lights, signs and all other items identified on the drawings.
- 12 Layout of all site improvements.

- B. Related work:

1. Division 31 Section "Excavation and Fill"
2. Division 31 Section "Erosion and Sediment Control"

3. Division 32 Section "Bituminous Asphalt Concrete Paving"

1.3 SUBMITTALS

- A. The Contractor shall submit for review a detailed Sequence of Construction Plan for all construction that differs from the guidelines set forth in the Contract Documents or if not completely defined in the Contract Documents to allow for Contractor flexibility. Sequence of Construction Plan shall include provisions for Emergency Operations due to weather, or any other site emergency. The Plan shall also include the location of temporary fencing, access gates and building egress routes. No work shall be allowed until Sequence of Operations plan is approved by the Owner's Representative and the Engineer.

1.4 REGULATORY REQUIREMENTS

- A. Conform to applicable local, state and federal regulations for disposal of debris.
- B. Burning of debris will not be allowed.
- C. Disposal of stumps on site will not be allowed.
- D. The Contractor shall provide written documentation of compliance with all disposal regulations.

1.5 JOB CONDITIONS

- A. Peripheral areas outside of the Contract Limits shall not be disturbed or used for storing materials without authorization of the Owner's Representative.
- B. Any damage to existing plant material or other improvements is the responsibility of the Contractor and shall be repaired or replaced immediately.
- C. Topsoil stockpile areas must be approved by the Owner's Representative prior to placement of topsoil stockpiles.
- D. Utilities:
 - 1. Arrange and pay for disconnecting, removing, capping and plugging utility services. Disconnect and stub off. Notify the affected utility companies in advance and obtain approval before starting this work.
 - 2. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

PART 2 – PRODUCTS

1.1 TIMBER GUARD RAIL

- A. Contractor shall provide new portions of timber guard rail for additional pieces that are needed or existing pieces that are deficient.
- B. New pieces of timber guard rail shall match in kind.

PART 3 - EXECUTION

3.1 GENERAL

- A. Conduct site clearing, demolition and preparation to ensure minimum interference with roads and adjacent property owners and as required by the Owner.
- B. Refer to Construction Documents for Construction Phasing and requirements and limitations on site clearing and grubbing.
- C. All sedimentation control devices as shown on the plans, or as directed, shall be installed prior to any excavation activities or stump removal. Construction methods shall conform to article 2.19.03 of the Form 818. See Section 01-5719 of the specifications.

3.2 PREPARATION

- A. Verify that existing plant life designated to remain is tagged or identified.
- B. Flag limits of clearing for review by the Engineer prior to the start of any construction.
- C. Identify required lines, levels, contours, and datum.
- D. Identify known underground utilities. Stake and flag locations.
- E. Identify and flag surface and aerial utilities.
- F. Notify the appropriate utility authority to remove and relocate utilities.
- G. Maintain and protect existing utilities remaining which pass through work area.

3.3 PROTECTION

- A. Identify and protect utilities that are to remain.
- B. Protect plant growth and features remaining as final landscaping. Minimum protection includes the installation of orange construction fencing at the limits of the canopy of existing trees. Other measures shall be as directed by the Owner.
- C. Protect control points, benchmarks, and existing work from damage or displacement.
- D. Any and all measures taken to protect the existing site features, either described in these documents and Contract Drawings or as directed by the Owner, shall be included in the cost of the work
- E. Protect above and below grade utilities which are to remain.
- F. Repair immediately any damage done to tree crowns or root systems.
- G. Prevent movement or settlement of adjacent structures. Provide and place bracing, shoring and

underpinning and be responsible for safety and support of structures. Assume liability for such movement, settlement, damage, or injury. Provide services of registered Structural Engineer to design bracing, shoring and/or underpinning if this work is required.

- H. Cease operations and notify The Owner's Representative and/or the Engineer immediately if safety of adjacent structures appears to be endangered. Take precautions to properly support structures. Do not resume operations until safety is restored.
- I. Prevent movement, settlement or collapse of adjacent services, sidewalks, driveways and trees. Assume liability for such movement, settlement or collapse. Promptly repair damage at no cost to the Owner.
- J. Provide, erect and maintain street boardings, sidewalk sheds, barricades, lighting and guardrails as required to protect general public, workers, and adjoining property.

3.4 CLEARING AND GRUBBING

- A. Install erosion controls prior to any stump removal. Completely remove stumps, roots, and other debris protruding through ground surface.
- B. Clear areas required for access to site and execution of the work.
 - 1. Limits of Clearing and Grubbing shall be restricted as indicated on the drawings and as required by regulatory agencies.
- B. Remove trees and shrubs within marked areas and as shown on the Drawings. Grub out stumps, roots and surface rock to a depth of 3 feet below any subgrade.
 - 1. Use only hand methods for grubbing inside drip line of trees indicated to remain.
- C. Clear undergrowth and deadwood, without disturbing subsoil.
 - 1. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

3.5 REMOVAL AND DISPOSAL

- A. All debris, trees, shrubs, brush, stumps, roots, and grass cleared and grubbed shall be removed and disposed of in accordance with all local, State and Federal regulations.
- B. Burning and/or burial of cleared and grubbed material on the site shall not be permitted.
- C. Contractor shall provide written documentation of proper disposal of all cleared and grubbed material and compliance with all applicable regulations.

3.6 "CALL BEFORE YOU DIG"

- A. Contractor shall notify "Call Before You Dig" (800) 922-4455 a minimum 48 hours prior to start of construction and every 30 days thereafter for the duration of the project.

3.7 STRIPPING AND STOCKPILING TOPSOIL

- A. Topsoil is defined as friable loam surface soil. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2 inches in diameter, without weeds, roots and other objectionable material.
- B. Contractor shall confirm the approximate quantity to be stripped and overall quality of topsoil to be stripped and shall review with the owner's Representative prior to proceeding with work.
 - 1. Topsoil test results on topsoil to be stripped shall be delivered to the Owner's Representative to determine acceptability of topsoil for reuse. See Section 329119 Topsoil for specific testing requirements.
- C. Strip topsoil to full depths encountered in a manner to prevent intermingling with the underlying subsoil or other objectionable material.
 - 1. Prepare the areas of existing loam so as to provide clump free topsoil. Use a sod cutting rototiller or other approved method.
 - 2. Where trees are indicated to be left standing, hold topsoil stripping a sufficient distance away to prevent damage to the root system.
- D. Stockpile topsoil in storage piles constructed to freely drain surface water. Generally, topsoil is to be stockpiled as indicated on the Drawings.
- E. Topsoil stockpiles shall be immediately seeded with 3 pounds of perennial ryegrass per 1,000 square feet to prevent erosion.
- F. Upon completion of the job, any excess topsoil, present, shall remain the property of the Owner. The Contractor shall haul all excess topsoil to a location designated by the Owner, at no additional cost to the Owner.

3.8 FIELD QUALITY CONTROL AND ENGINEERING

- A. All subgrades must be observed and approved by the Engineer prior to fill placement. Sufficient time must be given to the Engineer to observe and perform any necessary tests on the subgrade.
- B. The Contractor shall provide all offsets and other construction reference points necessary to establish and maintain location and elevation of all proposed improvements as shown on the Drawings and as field approved by the Owner's Representative during construction.
- C. The Contractor, at his own expense, shall do all engineering required for establishing grades, lines, levels, dimensions and reference points for all trades; shall be responsible for maintaining bench marks and other survey marks, and shall replace as directed, any bench marks which have been disturbed or destroyed.
- D. The Contractor shall compare all grades, lines, levels and dimensions as shown on the Drawings and actual site conditions, and shall promptly report to the Owner, before commencing work, any inconsistencies he may discover.

3.9 REMOVAL OF BITUMINOUS AND CONCRETE SURFACES

- A. Sawcut existing bituminous asphalt pavements to the lines indicated on the Contract Drawings. Edges shall be neat and straight. Contractor shall sawcut and remove the surface course of pavement to provide a 1-foot overlap.
- B. Sawcut existing concrete surfaces as indicated on the drawings. Sawcuts shall be made at the next nearest joint.
- C. Protect existing utilities, manhole covers, valve box covers, lighting, clean-outs, handholes, drainage structure tops, etc. Contractor shall provide all necessary shoring and bracing as may be required to protect and support the existing utilities to remain. Contractor shall replace at his own expense any utilities damaged as a result to this work.

3.10 PIPING & EXISTING IRRIGATION SYSTEM TO BE REMOVED

- A. Perform excavation in accordance with earthmoving and trenching sections. Provide shoring as required. Backfill in accordance with the above noted specification sections.
- B. Remove surface valves and heads, saw-cut piping to remain, cap ends.
- C. Note on record drawings locations of remaining piping.

3.13 DISPOSAL OF WASTE MATERIALS

- A. Burning and Burial: Burning and burial are not permitted on Owner's property.
- B. Clean up: Remove materials and debris from site preparation work as it accumulates.
 - 1. Do not place or store materials and debris within the limits of any existing street, public right-of-way or roadway.
 - 2. Parking, loading, and operation of trucks, dumpsters, etc. on existing highway and streets shall be governed by existing laws, ordinances, and regulations.
- C. Disposal of Debris: Remove waste materials and unsuitable and excess topsoil from Owner's property and dispose of off site legally and in a manner satisfactory to State, County, or local authorities having jurisdiction.

3.14 HAZARDOUS MATERIAL AND WASTE CONTROL

- A. Excavation and disposal of contaminated, polluted or "environmentally compromised" materials shall be conducted in conformance with the environmental and abatement specifications. The handling of contaminated polluted or "environmentally compromised" water to be discharged as a result of dewatering shall be performed in accordance with the environmental and abatement specifications.

END OF SECTION 02-4113

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. All applicable provisions of the General Conditions and the Special Conditions shall apply to the work of this Section.
- B. Scope: Provide all labor, materials, necessary equipment and services to complete the concrete formwork and cast-in-place concrete work as indicated on the drawings, specified herein or both. Work shall consist of, but not necessarily be limited to the following major items of work.
 - 1. Forms for sidewalks and bollard bases and any other concrete as shown on the drawings, or specified herein.
 - 2. Furnishing, placing and finishing of cast-in-place concrete for sidewalks bollard bases and any other concrete as shown on the drawings or specified herein.
 - 3. Placing of cast-in-items such as anchor bolts, and any other items shown on the drawings or as furnished under this and other sections.

1.2 RELATED DOCUMENTS

- A. Concrete Reinforcement, Section 032000

1.3 SUBMITTALS

- A. Submit sand and coarse aggregate source and physical properties.
- B. Submit laboratories trial mix designs proposed in accordance with Method 1, ACI 301 or one copy each of 30 consecutive test results and the mix design used from a record of past performance in accordance with ACI 301, Method 2.
- C. The Contractor shall submit the mix designs for approval at least ten (10) days before commencing any concrete operations.
- D. Submit catalog cuts and/or appropriate descriptive material and test results for non-shrink grout.

1.4 QUALITY ASSURANCE

- A. All work of this section shall be provided in accordance with the latest edition of the following standards which are considered to be a part of this specification the same as if fully set forth herein:

1. The State of Connecticut Department of Transportation Standard Specifications for Road and Bridge Construction (FORM 818).
- B. It is the intent of this specification to secure for every part of the work, concrete of homogeneous nature which, when hardened, will have the required strength, resistance to weathering, and such other qualities as the type of structure or its location may require.
- C. Concrete installer shall hold current ACI flatwork certification.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Cement shall be Portland Cement, Type I or II conforming to ASTM C150. Cement used in the work shall correspond to that upon which the selection of concrete proportions was based. Shall conform to Article M.03.01, CTDOT Form 818.
- B. Hi-early cement shall be used only with prior approval from the Engineer
- C. Concrete admixtures: provide admixtures produced and serviced by established, reputable manufacturer's recommendations.
- D. Air-entraining admixtures shall conform to ASTM C260. Water-reducing, set-controlling admixture shall conform to ASTM C494, Type A (water-reducing), Type D (water-reducing and retarding) and Type E (water-reducing, accelerating), Type F or G (high range water-reducing, superplasticizer).
- E. Admixtures containing calcium chloride or Thiocyanate shall not be used.
- F. Field Service: a qualified concrete technician employed by the manufacturer shall be available to assist in proportioning concrete materials for optimum use, to advise on proper use of the admixture and adjustment of concrete mix proportions to meet job site and climatic conditions.
- G. Aggregate:
 1. Fine aggregate shall conform to ASTM C33 and be clean, sharp, natural sand, free from loam, clay lumps, or other deleterious substance, within allowable standards.
 2. Coarse aggregate shall conform to ASTM C33 for normal weight concrete. All aggregate shall be clean, uncoated, graded aggregate, containing no clay, mud, loam, or foreign matter.
- H. Water shall be fresh, clean, and drinkable.
- I. Non-Shrink Grout:
 1. Grout under light poles after they are set to true levels with a pre-mixed, 5000 psi (after 3 days), grout meeting ASTM C1107
 2. Install in accordance with manufacturer's recommendations.

- J. Welded Steel Wire Fabric: Section 032000 and Sub article M.06.01-3, CTDOT Form 818.
- K. Reinforcement: Sub article M.06.01-1, CTDOT Form 818.
- L. Expansion joints shall utilize a full depth asphaltic saturated cellulosic fiber strip. Steel diamond shape load plates shall be utilized at all expansion joints in lieu of round dowels with the exception of areas where sidewalk ties into existing walks. Load plates, dowels and expansion joints shall be utilized at all locations where concrete is poured up against stationary objects
- M. Joint sealant shall be a one component polyurethane sealant meeting Federal Specification TT-S-00230C, Type 1, Class A and ASTM C-920, Type S, Grade P, Class 25.

PART 3 - EXECUTION

3.1 PROPORTIONING OF CONCRETE

- A. Concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, water, a water-reducing admixture, and an air-entraining admixture.
- B. Proportions of ingredients shall produce concrete, which will work readily into corners and angles of forms, and bond to reinforcement without segregation or excessive bleed water forming on the surface. Proportioning of materials shall be in accordance with ACI 211.1.
- C. Required Average Strength: Determinations of required average strength (f_c) above specified strength shall be in accordance with ACI 318 and evaluations of compressive strength results of field concrete shall be in accordance with ACI 214.

3.2 REQUIRED CONCRETE QUALITIES

- A. Specified Compressive Strength at 28 days shall be 4,500 psi with a maximum water-cement ratio of 0.45.
- B. Concrete subject to exposure shall be air-entrained. Total air content required (air-entrained and entrapped air) shall be 6% +/- 1.5%.
- C. Concrete shall be proportioned and produced to have a maximum slump of 4 inches unless a superplasticizer is used. A maximum slump of 6" shall be allowed if a superplasticizer is used. Consolidation shall be by means of vibrators.
- D. Maximum size of coarse aggregate shall not exceed 3/4" for all concrete types.
- E. Concrete shall be adjusted to produce the required rate of hardening for varied climatic and job site conditions.
 - 1. Under 50° F. ambient temperature - Accelerate (approval in writing required from the Engineer) (Type E admixture - ASTM C494).
 - 2. Over 80° F. ambient temperature - Retard (Type D admixture ASTM C494).

3. Between 50° F. and 80° F. - Normal Rate of Hardening (Type A admixture - ASTM C494).

3.3 FORMWORK PREPARATION

- A. Forms shall be used to confine and shape concrete to required dimensions. Forms shall have sufficient strength to withstand forces from placement and vibration of the concrete, and sufficient rigidity to maintain specified tolerances.
- B. Design, engineering, and construction of the formwork shall be the responsibility of the Contractor.
- C. Work shall be designed for loads, lateral pressure and allowable stresses in accordance with ACI 347, "Recommended Practice for Concrete Formwork."
- D. All tolerances, preparation of form surfaces, removal of forms etc. shall be in accordance with chapter 4 of ACI 301.

3.4 CONCRETE PLACEMENT

- A. Formwork shall have been completed and all snow, ice, water, and debris removed from within forms.
- B. Anchors and all embedded items shall have been positioned.
- C. Concrete shall utilize 6-inch square wire mesh, wire mesh shall have a minimum twelve-inch overlap. Wire mesh shall be placed on chairs spaced no more than eighteen inches on center.
- D. Subgrade shall be sprinkled sufficiently to eliminate water loss from the concrete.
- E. Concrete shall not be placed on frozen ground.
- F. Concrete shall be ready-mixed, batched, mixed and transported in accordance with ASTM C94.
- G. Preparations: Contractor shall provide access for delivery and provide sufficient equipment and manpower to rapidly place all concrete.
- H. Conveying: Concrete shall be handled from mixer to final deposit rapidly by methods, which will prevent segregation, or loss of ingredients to maintain required quality of concrete. It shall be placed in the forms or on grade as near as practicable to its final position and shall be prohibited from free falling more than 4 feet.
- I. Concrete shall be deposited continuously. Concrete shall be placed as nearly as possible to its final position. Avoid re-handling or flowing.
- J. Cold Weather Concrete:
 1. Temperature of concrete delivered at the job site shall comply with the requirements of ACI 306R, "Cold Weather Concreting."

2. Concrete temperature shall be maintained during cold weather for the recommended period of time specified in Table 1.4.2 in A.C.I. 306R.
 3. Special attention shall be given to the corners and edges of concrete during cold weather to prevent damage.
 4. Provisions shall be made to retain heat by using insulating blankets or by an outside heat source.
- K. Hot Weather Concrete:
1. Temperature of concrete delivered at the job site shall comply with the requirements of ACI 305R, "Hot Weather Concreting."
 2. Curing and Protection: Immediately following placement, concrete shall be protected from premature drying, hot and cold temperatures, rain, flowing water and mechanical injury. Materials and method of curing shall be approved by the Engineer.
- L. Sidewalks and pedestrian, ramps shall be floated to a smooth, dense uniform, broom textured finish with ¼ inch tooled joints and edging. Tooling shall be completed after the surface finish. No additional water shall be added to the surface to aid in finishing. If finishing aid is required, it shall be similar to Eucobar. During floating, while surface is still soft, check surface for flatness using a straightedge. Correct high spots by cutting down and correct low spots by filling in with material of same composition as floor finish. Remove any surface projections and re-float to a uniform texture.
- M. Repair of Surface Defects: All surface defects shall be repaired immediately after form removal according to Chapter 9 of the ACI 301.
- N. Do not place concrete when weather conditions prevent proper placement and consolidation, or when concrete has attained its initial set, or has contained its water or cement content for more than 1-1/2 hours.
- O. Concrete for sidewalks and ramps shall be placed between April 15th and October 15th unless previously requested and approved by the Owner.
- P. Expansion and contraction joints shall be as shown on the drawings.
- Q. Contraction Joints shall be ¼ of the overall depth of the concrete pour to ensure contraction of the material takes place at these locations.
- R. Concrete sidewalk wet cure shall commence immediately after finishing and continue uninterrupted for a period of 7 days, 5 days minimum. Wet cure shall utilize a non-marking curing paper or other curing cover similar to Hydra Cure Cover S16. Upon approval the contractor shall utilize a dissipating curing compound only if moisture curing is not feasible. Upon proper curing concrete sidewalks shall have joints filled with self-leveling sealer that matches the color of the concrete. Sidewalks shall be treated with salt guard sealer in accordance with manufactures instructions. Placement shall be witnessed by the Owner's Representative and/or the Engineer.

3.5 TESTING AND INSPECTION

- A. Materials and operations shall be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejections when defect is discovered.
- B. The following testing services shall be performed by the testing laboratory selected and paid for by the Owner:
 - 1. Test specimens in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders," ASTM C39. Two specimens shall be tested at 28 days for acceptance and one shall be tested at 7 days for information. An additional cylinder shall be made as an extra in case a 56-day break is required.
 - 2. Make one strength test for each 50 cu. yds. or fraction thereof, of each mix design of concrete placed in any one day. (One test consists of 4 cylinders.)
 - 3. Determine slump, air content and temperature for each strength test and whenever consistency of concrete appears to vary.
 - 4. All sampling of pumped concrete shall be done at the discharge end of the pump lines.
- C. To facilitate testing and inspection, the Contractor shall furnish necessary labor to assist testing agency in obtaining and handling samples at the job site.
- D. Owner agrees to pay for the above tests with the exception of work that is found to be defective. Subsequent tests shall be taken and paid for by the Contractor.
- E. Placement of concrete shall not be approved until test results have been forwarded to the Engineer and accepted.

END OF SECTION 03 30 00

SECTION 13 34 19

PRECAST CONCRETE BUILDING

1. GENERAL
 - 1.1 GENERAL REQUIREMENTS
 - A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions and all sections within Division 1 – General Requirements are hereby made a part of this Section.
 - 1.2 SCOPE OF WORK
 - A. Supply a factory-built precast concrete building as indicated and specified. The building shall be delivered to the jobsite by the Manufacturer and installed by the Contractor. The Manufacturer shall provide all lifting cables and hardware needed to off-load and set the building. Core drilling holes are the responsibility of the respective trades.
 - 1.3 RELATED SECTIONS
 - A. Section 02200: Earthwork
 - B. Section 09900: Painting
 - C. Section 15600: Heating, Ventilating and Air Conditioning
 - D. Division 16: Electrical
 - 1.4 REFERENCES
 - A. ACI 318: Building Code Requirements for Structural Concrete
 - B. ASTM C150: Portland Cement
 - C. ASTM C33: Concrete Aggregates
 - D. ASTM C260: Air-Entraining Admixtures for Concrete
 - E. ASTM A185: Steel Welded Wire Fabric for Concrete Reinforcement
 - F. ASTM C494: Chemical Admixtures for Concrete
 - G. ASTM A615: Deformed and Plain Billet Bars for Concrete Reinforcement
 - H. The 8th Edition Massachusetts State Building Code

I. Underwriters' Laboratories (UL).

J. 2009 International Building Code

1.5 SYSTEM DESCRIPTION

A. Design Requirements

1. The building shall have minimum interior dimensions as shown on the Drawings (width, length and headroom), and shall be constructed of steel-reinforced precast concrete.
2. The precast concrete building shall be such that the roof and walls are cast monolithically at manufacturer.
3. The floor shall be poured in place and permanently attached to the walls by four welded connections and a continuous shear keyway, which is filled with non-shrink grout. The grouted joint shall be watertight.
4. The building shall have a minimum roof thickness of five (5) inches, minimum floor thickness of eight (8) inches uniform across the entire slab, and a minimum wall thickness of three (3) inches.
5. The building shall be entirely factory assembled and shipped as a 1-piece unit. **Should the roof not be monolithically poured, a membrane roof shall be required.**
6. The exterior surface of the building shall receive one (1) coat of concrete sealer. The exterior trim shall receive one (1) coat of concrete sealer and one coat of acrylic coating, light tan in color.
7. The interior walls and ceiling of the building shall receive one (1) coat of concrete sealer and one (1) coat of acrylic coating, light gray in color. The interior coating shall be compatible as primer for installation of chemical resistant coating finish coats.

B. Design Responsibility

1. The building manufacturer shall be fully responsible for providing complete and adequately designed prefabricated precast structure as required and/or directed by the Engineer in accordance with the provisions set forth herein.
2. The building manufacturer shall engage, at his own expense, the services of a fully competent and qualified Professional Structural Engineer, registered in the State of Massachusetts for the design of all reinforced concrete, as necessary to accomplish the Work specified. The Professional Structural Engineer shall have a minimum of five (5) years documented experience in the field of structural design.
3. Penetrations for conduits and other mechanical utilities as shown on the Drawings shall be the responsibility of the Manufacturer.

C. Design Loads / Ratings

1. The building shall be designed to meet the Massachusetts Building Code.
2. Design load requirements shall be determined by local conditions, applicable codes, building end use, and shall be in accordance with the codes referenced in Paragraph 1.04.
3. Roof slab / ceiling slab designs shall account for the loads imposed on the slab by the weight of equipment that will be lifted from their positions for maintenance purposes by lifting hooks or other hoisting equipment installed in the slab.
4. Fire Rating: Factory Rated Class I

1.6 SUBMITTALS

A. Shop Drawings

1. Submit shop drawings for approval prior to fabrication. Shop drawings shall show dimensions, sizes, thickness, materials, finishes and methods of assembly.
2. Utility penetrations shall be dimensioned relative to the interior walls.
3. Shop Drawings shall be signed and sealed by a registered professional structural engineer who is licensed in the State of Massachusetts. Calculations to be submitted in accordance with Section 01300.
4. Submit Manufacturer's technical data for all building hardware and equipment.
5. Submit a list of ten (10) precast concrete buildings similar to the unit specified in this section that have been fabricated and placed into service. Include geographical location, name of the owner and type of building service.
6. Submit drawings showing the recommended subgrade bedding materials and depths for the building floor slab area.
7. Provide a complete listing of all references, codes and specifications used by the Registered Structural Engineer and that are required by any federal, state or local agency having jurisdiction, and to which the building design conforms.

B. Certificate of Design

1. Complete the "Certificate of Design" in its entirety, provided at the end of this section, for each location of work to be done, and any revisions associated therewith. Submit the "Certificate" simultaneously with, as an integral part thereof, the building submission. Any submission made without the completed "Certificate" appropriately signed and sealed, shall be returned to the Contractor. The Certification shall indicate that the building and all appurtenances related thereto are designed to withstand the required loads, forces to be encountered, and are in compliance with these specifications and all federal, state or local agencies having jurisdiction over the Work to be performed.

C. Quality Assurance/Control Submittals

1. Test reports on concrete and reinforcing steel.

1.7 QUALITY ASSURANCE

A. Qualifications

1. The precast concrete building shall be manufactured in a Precast/Prestressed Concrete Institute (PCI) certified plant. The Manufacturer must maintain "Certification in Good Standing" for product groups B and C, under the plant certification program.
2. Manufacturer shall have a minimum of five (5) years experience in precast concrete building fabrication. The Manufacturer shall have fabricated and placed into service no less than ten (10) buildings similar to the unit specified for this project.
3. Upon request from the Engineer, the building manufacturer shall prove financial stability and ability to produce the building within the specified delivery schedules. Evidence of facilities, equipment and expertise shall demonstrate the manufacturer's commitment to long-term customer service and product support.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading

1. Transportation, storage at the job site, site handling and setting shall be performed with acceptable equipment and methods as determined by the Manufacturer.
2. The building shall be shipped FOB to the job site by the Manufacturer.

B. Storage and Protection

1. The building shall be stored on dunnage placed at an acceptable location to prevent cracking, distortion or any other physical damage.

1.9 WARRANTY

- A. The Manufacturer shall warrant the building and its components for one year following completion and acceptance of the Work.
- B. The building shall be designed and manufactured to resist deterioration for a period of twenty-five (25) years.

2. PRODUCTS

2.1 MANUFACTURERS

- A. The precast concrete building shall be designed and manufactured by United Concrete, Wallingford, CT; or approved equal.
- B. Alternate systems based upon a built-in-place, field erected building utilizing precast or cast-in-place concrete shall not be considered.
- C. Pre-cast Concrete building (11'-6" x 20'-0" x 9'-10" Exterior height) complete with the following:
 - a. The precast concrete buildings shall have 3 1/2" walls, 5" to 4 1/2" sloped 1" over 5'-0" roof and 6" floor
 - b. Building shall be casted as a modular prefabricated building complete with finishes as listed below
 - c. CT. PE Stamped drawings
 - d. Penetrations to be provided for incoming electrical and mechanical where required
 - e. Third party certification (prior to shipping)
 - f. 5,000 psi concrete (to be confirmed during design)
 - g. Exterior Finish complete with the following:
 - i. California Brick Stucco on exterior complete (Color to be selected by owner from Standard Color Chart)
 - ii. Roof to be a Prefabricated wood truss system (hip) complete
 - iii. Roofing to be standard asphalt shingle roof system.
 - h. Interior Finish complete with the following:
 - i. Walls and ceiling shall one (1) base coat MasterSeal 581 and two (2) finish coats MasterProtect HB 400
 - ii. (Color to be selected by owner from standard color chart)
 - iii. Floor shall be coated with Sikaguard 62 epoxy (Color to be selected by owner from Standard Color Chart)
 - i. Doors, frames and Hardware complete with the following:
 - i. One (1) 3'-0" x 7'-0" 18-gauge galvanized steel door with stainless steel hinges. (Color by owner from
 - ii. standard color chart)
 - iii. All required door weather-stripping, door sweeps, and thresholds complete
 - iv. Cylinder locksets with levers
 - v. 9'-0" x 8'-0" Overhead door (Manual operation)
 - j. Mechanical complete with the following:
 - i. One (1) Wall exhaust fan 1700 CFM gravity shutter
 - ii. One (1) Intake louver - 30" x 30" (ELF375DX)
 - iii. One (1) Intake damper gravity
 - iv. One (1) Exhaust louver - 24" x 24"
 - k. Electrical complete with the following:

- i. One (1) 600A Main circuit breaker panel board-240/120V single phase
- ii. One (1) Remote mounted surge protective device
- iii. Six (6) LED Vapor tight fixtures
- iv. Four (4) LED Wall pack fixtures with integral photocells
- v. One (1) Exit/emergency combination fixtures
- vi. One Dual head remote mounted outdoor fixture for egress lighting
- vii. Six (6) 20A GFCI Receptacles
- viii. Two (2) Single pole toggle switches
- ix. One (1) Motor rated toggle switch
- x. One (1) Ventilation control panel
- xi. One (1) Cooling thermostat
- xii. One (1) Exterior mounted 600A circuit breaker enclosure
- xiii. One (1) 600A Rated current transformer cabinet
- xiv. One (1) 13 Terminal meter socket – Eversource approved
- xv. All interior conduit and wiring for power to install above listed equipment
- xvi. Conduit to be ridged galvanized steel, wire to be stranded type THHN
- xvii. Exterior lights to prevent vandalism

2.2 PRECAST CONCRETE BUILDING STRUCTURE

A. Fabrication

1. The building structure shall be fabricated and cast at the Building Manufacturer's facility in full accordance with approved structural designs and shop drawings.
2. The building manufacturer shall have a facility of sufficient size to house the entire assembled building within an environmentally controlled building until cured.

B. Concrete

1. Concrete used in the manufacture of the various structural components of the precast concrete building shall be factory batched and shall meet the following requirements:
 - a. Portland cement shall be Type 1, II or III conforming to ASTM C150.
 - b. Fine aggregate shall consist of natural sand conforming to ASTM C33.
 - c. Coarse aggregate shall consist of ½" maximum well graded crushed stone conforming to ASTM C33.
 - d. Air entrainment mixture shall conform to ASTM C260. The air-entrained content shall not be less than 4 percent and not greater than 7 percent.
 - e. A superplasticizer shall be used and shall conform to ASTM C494 type F or G. Concrete shall be placed at a slump of between 5 and 8 inches.
 - f. The concrete used for the structural components shall attain a minimum 28-day compressive strength of 5,000 psi.

C. Steel Reinforcing

1. Welded wire fabric shall conform to ASTM A185. Reinforcing steel shall be new billet steel meeting the requirements of ASTM A615.

2. All reinforcement shall be free from loose rust, oil, and contaminants, which reduce bond. Any foreign material shall be removed by suitable means prior to installation.
3. Provide supports for reinforcement including chairs, bolster bars and other devices for spacing and securing reinforcing in accordance with CRSI requirements. Legs of all supports in contact with exposed-to-view surfaces shall be plastic coated in accordance with CRSI, class I.

D. Surface Finishing

1. All interior surfaces of the precast structure shall be smooth, even and free from roughness, irregularities and other defects, and shall be suitable for receiving the interior finishes specified elsewhere herein.

E. Insulation and Acoustical Dampening

Insulation shall be provided to meet the Massachusetts Building Code, including insulation of the poured concrete floor.

The building shall be constructed with engine generator noise abatement that provides a sound level at 15' of 70 dBA or lower.

Personnel Door and Frame

1. The building shall be equipped with a 6' x 6'-8" double personnel door in the location shown on the Drawings. The door shall be constructed of standard thickness FRP face sheets and have an overall thickness of 1-3/4 inches. Core shall be 1-1/2 inch thick rigid polyurethane. The door shall be installed in an FRP door manufacturer's standard door frame.
2. A 3/4" National Guard stepped aluminum threshold shall be installed to protect against water infiltration into the building.
3. The door shall be equipped with three (3) 4 1/2" stainless steel door hinges with vandal resistant, non-removable hinge pins. The door shall include a Parker 500 Series, or equal, door closer.
4. The door shall include a heavy-duty, cylindrical lockset and latch protector.
5. A 1 1/2" X 2 1/2" aluminum drip strip shall be installed above the door.
6. The door shall be equipped with a hold-open arm.
7. The door and frame shall be as manufactured by CORRIM Company, or equal.

F. Loading Doors and Frame

1. The building shall be equipped with double 6' x 6'8" double door for material and equipment loading access in the location shown on the Drawings. The unobstructed opening in the building shall be 6' x 6'-8". The doors shall be constructed of standard thickness FRP face sheets and have an overall thickness of 1-3/4 inches. Core shall be 1-1/2 inch thick rigid polyurethane. The doors shall be installed in a FRP door manufacturer's standard door frame.
2. A 3/4" National Guard stepped aluminum threshold shall be installed to protect against water infiltration into the building.
3. Each door shall be equipped with three (3) 4 1/2" stainless steel door hinges with vandal resistant, non-removable hinge pins. The doors shall be hinged to allow for 180 degree opening to the outside. Provide stainless steel hardware for securing the doors to the building exterior walls while doors are in the open position.
4. The doors shall include a heavy-duty, cylindrical locksets and latch protectors.
5. A 1 1/2" X 2 1/2" aluminum drip strip shall be installed above the door.
6. The door shall be equipped with a hold-open arm.
7. The door and frame shall be as manufactured by CORRIM Company, or equal.

G. Acoustic Louvers

1. See Specification Section 15500.

2.3 FINISHES

A. Shop Finishes

1. The exterior surface and exterior trim shall receive one (1) coat of concrete sealer and one coat of acrylic coating, light tan in color.
2. The interior walls and ceiling of the building shall receive one (1) coat of concrete sealer and one (1) coat of acrylic coating, light gray in color.

2.4 SOURCE QUALITY CONTROL

A. Inspection

1. The building manufacturer shall conduct in-house concrete strength tests on six inch by 12 inch long test cylinders taken from the same concrete batch used on the actual component. Test cylinders shall be cured in the same manner as the actual components are cured. Test results shall be recorded and shall be submitted to the Engineer upon request.
2. As a minimum, five concrete test cylinders shall be made for each production day. One cylinder shall be tested at time of product stripping, (2) at 7 days, and (2) at 28 days.

3. The Engineer shall have the right to inspect or test any building materials during fabrication in the factory. At the option of the Engineer, certified tests of materials may be accepted in lieu of field tests.

3. EXECUTION

3.1 EXAMINATION

- A. Off-load structure at installation site using equipment of sufficient size and design to prevent injury or damage.
- B. Manufacturer shall provide written instructions for proper handling. Immediately after off-loading, contractor shall inspect complete structure and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all structure serial numbers and parts lists with shipping documents. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.2 INSTALLATION

- A. The Manufacturer shall provide all lifting cables and hardware needed to off-load and set the building to protect the building from damage.
- B. Prior to setting building, verify locations of floor penetrations. Install, level, and align building in the orientation shown on the Drawings.
- C. Core drilling holes for penetrations other than the penetrations shown on the drawings is the responsibility of the respective trades.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Services

1. The Contractor shall arrange for a qualified factory service representative from the building manufacturer to oversee the duties herein described if requested by the Engineer. Manufacturing representative shall be approved by the Engineer.

3.4 CLEANING

- A. Prior to acceptance, inspect interior and exterior of control building for dirt, splashed or damaged paint. Clean or repair accordingly. Remove all tools, surplus materials, scrap and debris from the job site.

3.5 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION

Sheet 1 of 3

CERTIFICATE OF DESIGN

(Owner)

Contract Reference: _____

_____, dated _____.

In accordance with the provisions of the above referenced Contract, as the designated Contractor,

(Contractor's Name and Address)

hereby certifies that _____

(Contractor's Engineer's Name and Address)

(1) Is properly licensed and currently registered as a Professional Engineer in the State (or Commonwealth) of _____;

(2) Is fully qualified to design and supervise the _____

(Item of work and location)

In accordance with the provision specified under the appropriate Section and/or Subsections of the Contract Documents:

(3) Has successfully designed and supervised _____

(Item of work)

before and demonstrates a minimum of five (5) documented years of proven experience in such field;

(4) Has personally examined the type(s) and locations(s) of the Work required under this Contract, and the overall conditions associated therewith, to the extent necessary to fully satisfy his or her professional responsibilities for designing and supervising the above referenced work;

- (5) Has prepared the attached design in full compliance with the applications and requirements of the Contract Documents, sound engineering practice, modern accepted principles of construction, and all applicable federal, state and local laws, regulations, rules and codes having jurisdiction over the Work;
- (6) Will provide sufficient supervision and technical guidance to the Contractor throughout the Work to ensure compliance with the design and all quality assurances necessary to successfully complete the Work;
- (7) Hereby indemnifies and holds harmless the
 _____ and BETA Group, Inc.,
 (Name of owner)
 and their agents, employees and representatives, from and against any and all claims, whether directly or indirectly, arising out of, relating to or in connection with the Work; and
- (8) This "Certificate of Design" together with all applicable designs, drawings, details, specifications on other related documents necessary to complete the Work as specified, have been signed and sealed pursuant to applicable state law.

In recognition and observance of the above referenced statements, the undersigned parties hereby acknowledge and accept the responsibilities and obligations associated therewith.

CONTRACTOR:

MANUFACTURER'S ENGINEER:

(Contractor's Name)

(Engineer's Name)

By: _____

By: _____

(Name and Title)

(Name and Title)

Date: _____

Date: _____

(SEAL) (P.E. STAMP)

(Note: Contractor to fully reference all attachments below)

SECTION 221113

WATER DISTRIBUTION PIPING

PART 1

1.01 SUMMARY

A. Section Includes

1. Requirements to furnish, lay, joint, and test ductile-iron pressure pipe, fittings (including special castings), and appurtenant materials and equipment indicated on the Drawings and specified in this Section.

1.02 REFERENCES

A. American Water Works Association (AWWA)/American National Standards Institute (ANSI)

1. C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. C105/A21.5, Polyethylene Encasement for Ductile Iron Pipe Systems
3. C110/A21.10, Ductile-Iron and Gray-Iron Fittings, 3-inch. through 48-inch., for Water and Other Liquids.
4. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron and Pressure Pipe and Fittings.
5. C150/A21.50, Thickness Design of Ductile-Iron Pipe.
6. C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast for Water.
7. C153/A21.53, Ductile-Iron Compact Fittings, 3 inches through 64 inches for Water Service
8. C219, Bolted, Sleeve-Type Couplings for Plain-End Pipe
9. C600, Installation of Ductile-Iron Water Mains and Their Appurtenances
10. C651, Disinfecting Water Mains

B. American Society of Testing and Materials (ASTM)

1. A536, Standard Specification for Ductile Iron Castings

1.03 SUBMITTALS

A. In accordance with SECTION 01300 submit the following:

B. Shop Drawings

1. Piping layouts in full detail.
2. Location and type of backup block or device to prevent separation.
3. Schedules of all pipe, fittings, special castings, couplings, expansion joints, restrained joints and other appurtenances.
4. Detailed disinfection plan consistent with AWWA C651.

C. Certificates

1. Sworn certificates of shop tests showing compliance with appropriate standard.

D. Manufacturer's Literature

1. Catalog cuts of joints, couplings, harnesses, expansion joints, restrained joints gaskets, fasteners and other accessories.
2. Brochures and technical data of coatings and lining's and proposed method of application.

1.04 QUALITY ASSURANCE

- A. Pipe and fittings to be inspected and tested at the foundry as required according to ANSI Standards.
- B. Owner reserves right to inspect and/or test by independent service at manufacturer's plant or elsewhere at his own expense.
- C. Owner reserves right to perform visual and hammer test prior to installation.

PART 2 PRODUCTS

2.01 PIPE

A. Ductile-Iron Pipe

1. Designed in accordance with AWWA/ANSI C150/ A21.50.
 - a. Ductile iron pipe used for water mains shall be cement lined Pressure Class 350 push-on or mechanical joint, size as indicated on the Drawings.
 - b. For sewer pipeline use class as indicated on the Drawings.
2. Manufactured in accordance with AWWA/ANSI C151/A21.51.
 - a. Unless otherwise indicated or specified, ductile-iron pipe shall be at least thickness Class 52

B. Pipe For Use With Couplings

1. As specified above except that the ends shall be plain (without bells or beads) cast or machined at right angles to the axis.

2.02 FITTINGS

A. General

1. Push-on or mechanical-joint fittings shall be all-bell fittings unless otherwise indicated or specified.
2. In accordance with AWWA/ANSI C110/A21.10.
 - a. Fittings 24-inches in diameter and less shall be pressure Class 350.
 - b. Fittings 30-inches to 48-inches in diameter shall be at least pressure Class 250.

Or

3. Compact fittings in accordance with AWWA/ANSI C153/A21.53 and shall have a working pressure rating of 350 psi

B. Nuts and Bolts

1. Ductile Iron or Kor-10 steel T bolts and nuts or approved equal.

C. Nonstandard Fittings

1. Fittings having nonstandard dimensions and cast especially for this project shall be of acceptable design.
2. Manufactured to meet the requirements of these specifications and shall have the same diameter and thickness as standard fittings, but their laying lengths and types of ends shall be determined by their positions in the pipelines and by the particular piping to which they connect.

2.03 ADAPTERS

- A. Where it is necessary to joint pipes of different type, furnish and install the necessary adapters unless solid sleeves are indicated on the drawings or permitted. Adapters shall have ends, conforming to the above specifications for the appropriate type of joint, to receive the adjoining pipe. Adapters joining two classes of pipe may be of the lighter class provided that the annular space in bell-and-spigot type joints will be sufficient for proper jointing.

2.04 JOINTS

A. Push-On and Mechanical

1. In accordance with AWWA/ANSI C111/A21.11.
2. The plain end of push-on pipe shall be factory machined to a true circle and chamfered to facilitate fitting the gasket.
3. Push-on and mechanical-joint pipe and fittings shall be provided with sufficient quantities of accessories conforming to AWWA/ANSI C111/A21.11.

B. Restrained

1. Location of restrained joints shall be based on Thrust Restraint Design for Ductile Iron Pipe (Second Edition), published by Ductile Iron Pipe Research Association.
2. Restraining glands will be required on all fittings.
3. Pipe, fittings and appurtenances for restrained joints shall be in accordance with **[AWWA/ANSI C110/A21.10 for full body fittings] [AWWA/ANSI C153/A21.53 for compact fittings]**. Only restraining glands which impart multiple wedging action against the pipe increasing its pressure as the pipe pressure increases will be allowed. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536. Twist off nuts shall be used to insure proper actuating of the restraining device.
4. Mechanical joint restraint shall have a working pressure rating of at least 250 psi.
5. Manufactured by EBAA Iron, Inc., Eastland, Texas, or equal.

C. Gaskets

1. Gaskets shall be of a composition suitable for exposure to the product which the pipe is intended.

2.05 COUPLINGS

A. Flexible Connections

1. Where flexible connections in the piping are specified or indicated on the drawings, they shall be obtained by the use of sleeve-type couplings, split couplings, or mechanical-joint pipe and/or fittings as herein specified.

B. Sleeve Type Couplings

1. Pressure rating at least equal to that of the pipeline in which they are to be installed.
2. For sizes 2 1/2 to 16-inch diameter, up to 250 psi working pressure:
 - a. Provide style 442 Long Sleeve, Cast Coupling by Smith Blair, Inc., Texarkana, Texas, or be acceptable equivalent products.
3. For sizes greater than 16-inch diameter, up to 150 psi working pressure:
 - a. Provide style 411, with 10-inch long sleeve minimum, Steel Coupling by Smith Blair, Inc., Texarkana, Texas, or be acceptable equivalent products.
4. Nuts and Bolts to be **[stainless steel]**, unless noted otherwise.
5. Provided with gaskets of a composition suitable for exposure to the liquid within the pipe.
6. Provide with fusion bonded epoxy finish.
7. Conform to requirements of AWWA C219.

C. Solid Sleeve Couplings

1. Solid sleeve couplings and accessories shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.
2. Couplings shall be ductile iron with gaskets of a composition suitable for exposure to the liquid within the pipe.

2.06 ACCESSORIES**A. Tapped Connections**

1. Tapped connections in pipe and fittings shall be made in such manner as to provide a watertight joint and adequate strength against pullout. The maximum size of taps in pipe or fittings without bosses shall not exceed the listed size in the appropriate table of the Appendix to the above-mentioned ANS A21.51 based on 3 full threads for cast iron and 2 full threads for ductile iron.
2. Where the size of the connections exceeds that given above for the pipe in question, a boss shall be provided on the pipe barrel, the tap shall be made in the flat part of the intersection of the run and branch of a tee or cross, or the connection shall be made by means of a tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, all as indicated or permitted by the Engineer.
3. All drilling and tapping of cast-iron pipe shall be done normal to the longitudinal axis of the pipe; fitting shall be drilled and tapped similarly, as appropriate. Drilling and tapping shall be done only by skilled mechanics. Tools shall be adapted to the work and in good condition so as to produce good, clean-cut threads of the correct size, pitch, and taper.

2.07 POLYETHYLENE ENCASEMENT

- A. In accordance with AWWA C105.

2.08 FINISHES**A. Lining**

1. Inside of pipe and fittings shall be coated with double thickness cement lining and bituminous seal coat conforming to AWWA/ANSI C104/A21.4.

B. Coating

1. Outside of pipe and fittings shall be coated with the standard bituminous coating conforming to AWWA/ANSI C151/A21.51

PART 3 EXECUTION

3.01 HANDLING

A. Pipe and Fittings

1. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring machined surfaces, and abrasion of the pipe coatings.
2. Any fitting showing a crack and any pipe or fitting which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the Work.
3. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.

3.02 CUTTING

A. Pipe

1. Except as otherwise approved, all cutting shall be done with a machine having rolling wheel cutters, knives, or saws adapted to the purpose. Hammer and chisel or so-called wheel span cutters shall not be used to cut pipe. All cut ends shall be examined for possible cracks caused by cutting.
2. Cut ends to be used with push-on joints shall be carefully chamfered to prevent cutting the gasket when the pipe is laid or installed.

3.03 INSTALLATION

A. Pipe and Fittings

1. No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.
2. Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.
3. Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or required. Care shall be taken to ensure a good alignment both horizontally and vertically.
4. Pipe shall have a firm bearing along its entire length. No pipe or fitting shall be permanently supported on saddles, blocking, or stones.
5. The deflection of alignment at a joint shall not exceed the appropriate permissible deflection as specified in the tabulation titled PIPE DEFLECTION ALLOWANCES.

PIPE DEFLECTION ALLOWANCES

Maximum permissible deflection, in.*

| <u>Size of pipe, in.</u> | <u>push-on joint</u> | <u>Mechanical joint</u> |
|--------------------------|----------------------|-------------------------|
| 4 | 19 | 31 |
| 6 | 19 | 27 |
| 8 | 19 | 20 |
| 10 | 19 | 20 |
| 12 | 19 | 20 |
| 14 | 11 | 13-1/2 |
| 16 | 11 | 13-1/2 |
| 18 | 11 | 11 |
| 20 | 11 | 11 |
| 24 | 11 | 9 |
| 30 | 11 | 9 |
| 36 | 11 | 8 |
| 42 | 7-1/2 | 7-1/2 |
| 48 | 7-1/2 | 7-1/2 |
| 54 | 5-1/2 | -- |

*Maximum permissible deflection for 18-ft. lengths; maximum permissible deflections for other lengths shall be in proportion of such lengths to 18 ft.

6. When mechanical joint, push-on joint or similar pipe is laid, the bell of the pipe shall be cleaned of excess tar or other obstructions and wiped out before the cleaned and prepared spigot of the next pipe is inserted into it. The new pipe shall be shoved firmly in-place until properly seated and held securely until the joint has been completed.

B. Castings

1. Castings to be encased in masonry shall be accurately set with the bolt holes, if any, carefully aligned.
2. Immediately prior to being set, castings shall be thoroughly cleaned of all rust, scale and other foreign material.

C. Temporary Plugs

1. At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

D. Appurtenances

1. Valves, fittings and appurtenances shall be set and jointed as indicated on the drawings.

3.04 ASSEMBLING

A. Push-On Joints

1. Make up by inserting the gasket into the groove of the bell and applying a thin film of special nontoxic gasket lubricant uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe.

2. The chamfered end of the plain pipe shall be inserted into the gasket and then forced past it until it seats against the bottom of the socket.

B. Bolted Joints

1. Before the pieces are assembled, rust-preventive coatings shall be removed from machined surfaces.
2. Pipe ends, sockets, sleeves, housings, and gaskets shall be thoroughly cleaned and all burrs and other defects shall be carefully smoothed.

C. Mechanical Joints

1. Surfaces against which the gasket will come in contact shall be thoroughly brushed with a wire brush prior to assembly of the joint. The gasket shall be cleaned. The gasket, bell, and spigot shall be lubricated by being washed with soapy water.
2. The gland and gasket, in that order, shall be slipped over the spigot, and the spigot shall be inserted into the bell until it is correctly seated.
3. The gasket shall then be seated evenly in the bell at all points, centering the spigot, and the gland shall be pressed firmly against the gasket.
4. After all bolts have been inserted and the nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint to the proper tension, preferably by means of a torque wrench.
5. The correct range of torque as indicated by a torque wrench and the length wrench (if not a torque wrench) used by an average man to produce such range of torque, shall not exceed the values specified in the tabulation titled TORQUE RANGE VALUES.

TORQUE RANGE VALUES

| Nominal pipe size, <u>in. in.</u> | Bolt diameter, <u>ft.-lb.</u> | Range of torque, <u>in.</u> | Length of wrench, |
|---|-------------------------------------|-----------------------------------|----------------------|
| 3 | 5/8 | 40-60 | 8 |
| 4 thru 24 | 3/4 | 60-90 | 10 |
| 30, 36 | 1 | 70-100 | 12 |
| 42, 48 | 1-1/4 | 90-120 | 14 |

If the effective sealing of the joint is not attained at the maximum torque indicated above, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be over stressed to tighten a leaking joint.

D. Restrained Joints

1. Install in accordance with manufacturers written instructions.
2. Do not exceed manufacturer’s permissible pipe deflection allowance.

E. Sleeve-Type Couplings

1. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8-inches
2. Soapy water may be used as a gasket lubricant.
3. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6-inches from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint.

4. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid.
5. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares.
6. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts. The correct torque as indicated by a torque wrench shall not exceed the manufacturers recommended values
7. After assembly and inspection and before being backfilled, all exterior surfaces of buried sleeve-type couplings, including the middle and follower rings, bolts, and nuts, shall be thoroughly coated with an approved heavy-bodied bituminous mastic. Care shall be taken and appropriate devices used to ensure that the undersides, as well as the more readily accessible parts, are well coated.

3.05 POLYETHYLENE ENCASEMENT

- A. When required, install in accordance with AWWA C105.

3.06 INSULATION

- A. Factory applied insulation to be in accordance with Specification Section 15260.
- B. Field applied insulation,
 1. Prior to the field installation, the pipe shall be thoroughly cleaned to allow for the installation of the insulation around the full diameter of the pipe.
 2. Pipe insulation shall be installed in the dry.
 3. Install in accordance with manufacturers written instructions.

3.07 SOCKET PIPE CLAMPS, TIE RODS AND BRIDLES

- A. Where indicated or necessary to prevent joints or sleeve couplings from pulling apart under pressure, suitable pipe clamps, tie rods or bridles shall be provided. Bridles and tie rods shall be at least 3/4 in. diameter except where they replace flange bolts of smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The socket clamps, tie rods or bridles shall be coated with an approved bituminous paint after assembly or if necessary, prior to assembly.

3.08 PIPING SUPPORT (THRUST BLOCK)

- A. Where necessary, bends, tees, and other fittings in pipelines buried in the ground may be backed up with 3000 psi concrete placed against undisturbed earth where firm support can be obtained. If the soil does not provide firm support, then restraining devices shall be provided.

3.09 CLEANING

- A. Prior to the pressure and leakage tests, thoroughly clean piping of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings.

3.10 TESTING

- A. Except as otherwise directed, pipelines shall be given combined pressure and leakage tests in sections of approved length.
 - 1. Provide 24 hour notice to Engineer for all testing
 - 2. The Contractor shall make arrangements for procuring water for testing and be responsible for all associated fees.
- B. Furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gages, relief valves, other necessary equipment; and all labor required.
- C. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when he desires.
- D. However, pipelines to be embedded in concrete shall be tested prior to placing of the concrete and exposed piping shall be tested prior to field painting.
- E. Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If hydrants or blow offs are not available at high points for releasing air the Contractor shall make the necessary excavations and do the necessary backfilling and make the necessary taps. After completion of the tests, if directed by the Engineer, remove corporations and plug said holes.
- F. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
- G. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gage location) to a pressure in pounds per square inch numerically equal to the pressure rating of the pipe but not to exceed 200 psi. Do not apply this pressure to items of equipment known to be incapable of withstanding such pressure.
- H. If the Contractor cannot achieve the specified pressure and maintain it for a period of **[one]** hour with no additional pumping, the section shall be considered as having failed to pass the test. Allowable leakage over the **[one]** hour period shall be calculated per AWWA C-600 as summarized in the following table.

Hydrostatic Testing Allowance per 1,000 ft. of Pipe
(Loss in U.S. Gallons Following a 2 Hour Test)

| Nominal Pipe Diameter | | | | | | |
|-----------------------|-------|-------|--------|--------|--------|--------|
| Avg. Pipe Press. | 6 in. | 8 in. | 12 in. | 16 in. | 24 in. | 36 in. |
| | | | | | | |

| | | | | | | |
|-------|------|------|------|------|------|------|
| (psi) | | | | | | |
| 150 | 1.10 | 1.48 | 2.20 | 2.94 | 4.42 | 6.61 |
| 175 | 1.18 | 1.60 | 1.38 | 3.18 | 4.76 | 7.16 |
| 200 | 1.28 | 1.70 | 2.56 | 3.40 | 5.10 | 7.64 |

- I. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test and is considered acceptable by the Engineer.
- J. If, in the judgment of the Engineer, it is impracticable to follow the foregoing procedure exactly for any reason, modifications in the procedure may be made as required and approved by the Engineer, but in any event the Contractor shall be fully responsible for the ultimate tightness of the line within the above leakage and pressure requirement.
- K. All testing to be witnessed by the Engineer.

3.11 DISINFECTING AND FLUSHING

- A. The Contractor shall disinfect the lines carrying potable water.
- B. Furnish all equipment and materials necessary to do the work of disinfecting, and shall perform the work in accordance with the procedure outlined in the AWWA Standard C651 except as otherwise specified herein.
- C. During the disinfection period, care shall be exercised to prevent contamination of water in existing mains.
- D. The dosage shall be such as to produce a chlorine concentration of not less than 10 PPM (mg/l) after a contact time of not less than 24 hours.
- E. After treatment, the main shall be flushed with clean water until the residual chlorine content does not exceed 0.2 PPM (mg/l).
- F. Before disposing of the water used in disinfecting and flushing water mains thoroughly neutralize it through the application of a reducing agent, as referenced in AWWA C651.
- G. Dispose of the water used in disinfecting and flushing in an approved manner.
- H. Connection at cut ins shall be swabbed with 50 PPM solution of chlorine at locations when above methods are not possible.
- I. Bacteriological sampling and testing shall be done in accordance with AWWA C651 for each main and each branch. Sampling shall be accomplished with sterile bottles treated with sodium thiosulfate, as required by Standard Methods. No hose or fire hydrants shall be used in collection of samples. A corporation stop installed on the main, with a removable copper tube gooseneck assembly, is the recommended method.

- J. Testing shall be done by a laboratory approved by the Engineer, in accordance with Standard Methods, and shall show the absence of coliform organisms. A standard plate count may be required at the option of the Engineer.

END OF SECTION

SECTION 26 0505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

1.02 RELATED REQUIREMENTS

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Sustainable Design Documentation: Submit certification of removal and appropriate disposal of abandoned cables containing lead stabilizers.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to City of Hartford before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems indicated to be removed on the drawings. Safe off any open terminations.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from City of Hartford at least 24 hours before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
 - 1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
 - 2. PCB- and DEHP-containing lighting ballasts.

3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
 - B. Remove, relocate, and extend existing installations to accommodate new construction.
 - C. Remove abandoned wiring to source of supply.
 - D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
 - E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
 - F. Repair adjacent construction and finishes damaged during demolition and extension work.
 - G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- 3.04 CLEANING AND REPAIR
- A. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.
 - B. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Wiring connectors.
- C. Electrical tape.
- D. Cable ties.

1.02 RELATED REQUIREMENTS

- A. Section 26 0505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); Federal Specification; 2008a (Validated 2019).
- F. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- I. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- J. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- K. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- L. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- M. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
- N. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

- O. UL 1277 - Electrical Power and Control Tray Cables with Optional Optical-Fiber Members; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
 - 3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Manufactured Wiring System Shop Drawings: Provide plan views indicating proposed system layout with components identified; indicate branch circuit connections.
- D. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.
- E. Field Quality Control Test Reports.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Engineer and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 26 0526.
- H. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- I. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG. See drawings for feeder conductor sizes.
- J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- K. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 - 1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. Southwire Company: www.southwire.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Size 4 AWG and Larger: Type XHHW-2.
 - b. Installed Underground: Type XHHW-2.

2.04 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

2.05 ACCESSORIES

- A. Electrical Tape:
 - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
- B. Cable Ties: Material and tensile strength rating suitable for application.

END OF SECTION

SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.
- F. Chemically-enhanced ground electrodes.
- G. Ground enhancement material.
- H. Ground access wells.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 5600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2017.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Shop Drawings:

1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Field quality control test reports.
- F. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
- F. Grounding Electrode System:
 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.

- b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 2. Ground Ring:
 - a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
 - b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
 - c. Provide ground enhancement material around conductor where indicated.
 3. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
 - c. Provide ground enhancement material around electrode where indicated.
 - d. Provide ground access well for each electrode.
 4. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
 5. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
 - a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
 - b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
 - c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
- G. Service-Supplied System Grounding:
 1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
 2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
 1. Provide grounding electrode system for each separate building or structure.
 2. Provide equipment grounding conductor routed with supply conductors.
 3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
 4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.
- I. Bonding and Equipment Grounding:
 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical

conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:

1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gage of specified conductors.

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 - a. Exceptions:
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
4. Manufacturers - Exothermic Welded Connections:
 - a. Burndy LLC: www.burndy.com/#sle.
 - b. Cadweld, a brand of Erico International Corporation: www.erico.com/#sle.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.
4. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
 - b. Erico International Corporation: www.erico.com/#sle.
 - c. Harger Lightning & Grounding: www.harger.com/#sle.

- d. Substitutions: See Section 01 6000 - Product Requirements.
- E. Ground Rod Electrodes:
 - 1. Comply with NEMA GR 1.
 - 2. Material: Copper-bonded (copper-clad) steel.
 - 3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
 - 4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.
 - 5. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
 - b. Erico International Corporation: www.erico.com/#sle.
 - c. Galvan Industries, Inc: www.galvanelectrical.com/#sle.
- F. Ground Enhancement Material:
 - 1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.
- G. Ground Access Wells:
 - 1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
 - 2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
 - a. Round Wells: Not less than 8 inches in diameter.
 - b. Rectangular Wells: Not less than 12 by 12 inches.
 - 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
 - 4. Cover: Factory-identified by permanent means with word "GROUND".

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
 - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
- D. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05 5000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- D. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- E. Section 26 5600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.05 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
 - 1. Fiberglass Channel (Strut) Framing Systems: Include requirements for strength derating according to ambient temperature.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Derating Calculations for Fiberglass Channel (Strut) Framing Systems: Indicate load ratings adjusted for applicable service conditions.
- E. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
- F. Installer's Qualification Statement: Include evidence of compliance with specified requirements.
- G. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
- E. Installer Qualifications for Field-Welding: As specified in Section 05 5000.
- F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 2. Conduit Clamps: Bolted type unless otherwise indicated.
 3. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Erico International Corporation: www.erico.com/#sle.
 - c. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
 - d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - e. Thomas & Betts Corporation: www.tnb.com/#sle.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Busway Supports: 1/2 inch diameter.
 - c. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
 - d. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
- D. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 4. Hollow Masonry: Use toggle bolts.
 5. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 6. Sheet Metal: Use sheet metal screws.
 7. Powder-actuated fasteners are not permitted.
 8. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch minimum base metal thickness.
 - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
 9. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
 10. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc: www.us.hilti.com/#sle.
 - b. Powers Fasteners, Inc: www.powers.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.
 - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Conduit Support and Attachment: Also comply with Section 26 0533.13.
- J. Box Support and Attachment: Also comply with Section 26 0533.16.
- K. Exterior Luminaire Support and Attachment: Also comply with Section 26 5600.
- L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- M. Secure fasteners according to manufacturer's recommended torque settings.
- N. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Rigid polyvinyl chloride (PVC) conduit.
- C. Conduit fittings.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems.
- D. Section 26 0533.16 - Boxes for Electrical Systems.
- E. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.
- F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- D. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
- E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- F. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
- G. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- J. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- K. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.

4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- C. Shop Drawings:
 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
 2. Include proposed locations of roof penetrations and proposed methods for sealing.
- D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 1. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit for power conductors.
 2. Exterior, Direct-Buried: Use rigid PVC conduit for telecommunication cables.
- D. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.

2.02 CONDUIT REQUIREMENTS

- A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.

- C. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
- D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
 - 2. Nucor Tubular Products: www.nucortubular.com/#sle.
 - 3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
 - 1. Cantex Inc: www.cantexinc.com/#sle.
 - 2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
 - 3. JM Eagle: www.jmeagle.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- E. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - 5. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 6. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 7. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 8. Arrange conduit to provide no more than 150 feet between pull points.
- F. Conduit Support:
 - 1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide required vibration isolation and/or seismic controls in accordance with Section 26 0548.
 - 3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- G. Connections and Terminations:
 - 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 - 3. Use suitable adapters where required to transition from one type of conduit to another.
 - 4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 - 5. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 - 6. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- H. Penetrations:
 - 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 - 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- I. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 2316.13.
 2. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches.
 3. Provide underground warning tape in accordance with Section 26 0553 along entire conduit length for service entrance where not concrete-encased.
- J. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where conduits are subject to earth movement by settlement or frost.
- K. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- L. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- M. Provide grounding and bonding in accordance with Section 26 0526.
- 3.03 FIELD QUALITY CONTROL
- A. See Section 01 4000 - Quality Requirements, for additional requirements.
 - B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
 - C. Correct deficiencies and replace damaged or defective conduits.
- 3.04 CLEANING
- A. Clean interior of conduits to remove moisture and foreign matter.
- 3.05 PROTECTION
- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

CONDUIT FOR ELECTRICAL
SYSTEMS

26 0533.13-6

SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Underground boxes/enclosures.
- D. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems.
- D. Section 26 0533.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
- E. Section 26 2726 - Wiring Devices:
 - 1. Wall plates.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. SCTE 77 - Specification for Underground Enclosure Integrity; 2017.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 508A - UL Standard for Safety Industrial Control Panels; 2018.
- L. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures and underground boxes/enclosures.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- E. Maintenance Materials: Furnish the following for City of Hartford's use in maintenance of project.
 1. See Section 01 6000 - Product Requirements, for additional provisions.
 2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use suitable concrete type boxes where flush-mounted in concrete.
 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 6. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 7. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 8. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
 9. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 10. Wall Plates: Comply with Section 26 2726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
 3. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
 - b. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
 - c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- D. Underground Boxes/Enclosures:
1. Description: In-ground, solid bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.

2. Size: As indicated on drawings.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
4. Applications:
 - a. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
 - a. Manufacturers:
 - 1) Hubbell Incorporated; Quazite Products: www.hubbellpowersystems.com/#sle.
 - 2) MacLean Highline: www.macleanhigline.com/#sle.
 - 3) Oldcastle Precast, Inc: www.oldcastleprecast.com/#sle.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.
 - b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.
 - c. Product(s):
 - 1) MacLean Highline PHA Series: Straight wall, all-polymer concrete splice box/pull box; available Tier 8, Tier 15, and Tier 22 load ratings.
 - 2) MacLean Highline CHA Series: Fiberglass/polymer concrete splice box/pull box; available Tier 8 and Tier 15 load ratings.
 - 3) MacLean Highline CVA Series: Fiberglass/polymer concrete splice vault; available Tier 8, Tier 15, and Tier 22 load ratings.

2.02 ACCESSORIES

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- F. Box Supports:
 1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

- G. Install boxes plumb and level.
 - H. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
 - I. Install boxes as required to preserve insulation integrity.
 - J. Underground Boxes/Enclosures:
 - 1. Install enclosure on gravel base, minimum 6 inches deep.
 - 2. Flush-mount enclosures located in concrete or paved areas.
 - 3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
 - 4. Provide cast-in-place concrete collar constructed in accordance with Section 03 3000, minimum 10 inches wide by 12 inches deep, around enclosures that are not located in concrete areas.
 - 5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
 - K. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
 - L. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
 - M. Close unused box openings.
 - N. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
 - O. Provide grounding and bonding in accordance with Section 26 0526.
- 3.03 CLEANING
- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.
- 3.04 PROTECTION
- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 09 9113 - Exterior Painting.
- B. Section 09 9123 - Interior Painting.
- C. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- D. Section 26 2726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.
- E. Section 27 1000 - Structured Cabling: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.

- 3) Identify power source and circuit number. Include location when not within sight of equipment.
- 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
- 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
- 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- b. Time Switches:
 - 1) Identify load(s) served and associated circuits controlled. Include location.
- c. Enclosed Contactors:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
2. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
3. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
4. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
5. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
6. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
- B. Identification for Conductors and Cables:
 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
 2. Identification for Communications Conductors and Cables: Comply with Section 27 1000.
 3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 4. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
 5. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
 6. Use underground warning tape to identify direct buried cables.
- C. Identification for Raceways:
 1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
 2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.

- a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
 - 1) Field-Painting: Comply with Section 09 9123 and 09 9113.
 - 2) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.
3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
4. Use underground warning tape to identify underground raceways.

D. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.
2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.

E. Identification for Devices:

1. Identification for Communications Devices: Comply with Section 27 1000.
2. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Manufacturers:
 - a. Brimar Industries, Inc: www.brimar.com/#sle.
 - b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - c. Seton Identification Products: www.seton.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:
 - a. Brady Corporation: www.bradyid.com/#sle.
 - b. Brother International Corporation: www.brother-usa.com/#sle.
 - c. Panduit Corp: www.panduit.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:

- a. Equipment designation or other approved description.
 - b. Other information as indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height:
 - a. System Designation: 1 inch.
 - b. Equipment Designation: 1/2 inch.
 - c. Other Information: 1/4 inch.
 - d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
 5. Color:
 - a. Normal Power System: White text on black background.
 - 1) 480Y/277 V, 3 Phase Equipment: White text on black background.
 - 2) 208Y/120 V, 3 Phase Equipment: White text on black background.
- D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch by 2.5 inches.
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/4 inch.
 5. Color: Black text on white background unless otherwise indicated.
- E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches by 4 inches.
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/2 inch.
 5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Control Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
 2. Legend: Load controlled or other designation indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch.
 5. Color: Black text on clear background.

2.03 WIRE AND CABLE MARKERS

- A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
 2. HellermannTyton: www.hellermannntyton.com/#sle.
 3. Panduit Corp: www.panduit.com/#sle.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.

- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com/#sle.
 - 2. Brimar Industries, Inc: www.brimar.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- D. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
 - 2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
 - 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- E. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
- F. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com/#sle.
 - 2. Brimar Industries, Inc: www.brimar.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
- B. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- C. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.
- D. Legend: Type of service, continuously repeated over full length of tape.
- E. Color:

2.06 WARNING SIGNS AND LABELS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.brimar.com/#sle.
 - 2. Clarion Safety Systems, LLC: www.clarionsafety.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
 - 1. Materials:
 - 2. Minimum Size: 7 by 10 inches unless otherwise indicated.

D. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conduits: Legible from the floor.
 8. Boxes: Outside face of cover.
 9. Conductors and Cables: Legible from the point of access.
 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
- G. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

SECTION 26 2100
LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical service requirements.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.
- B. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- D. Section 26 0529 - Hangers and Supports for Electrical Systems.
- E. Section 26 0533.13 - Conduit for Electrical Systems.
- F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 26 2413 - Switchboards: Service entrance equipment.
- H. Section 26 2416 - Panelboards: Service entrance equipment.
- I. Section 26 2713 - Electricity Metering: Non-utility electrical metering.
- J. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 DEFINITIONS

- A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.04 REFERENCE STANDARDS

- A. IEEE C2 - National Electrical Safety Code; 2017.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
- B. Coordination:
 - 1. Verify the following with Utility Company representative:
 - a. Utility Company requirements, including division of responsibility.
 - b. Exact location and details of utility point of connection.
 - c. Utility easement requirements.
 - d. Utility Company charges associated with providing service.
 - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
 - 3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.

5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.
- D. Utility Company charges associated with providing permanent service to be paid by Owner.
- E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.
- F. Scheduling:
 1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.06 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Utility Company letter of availability for providing electrical service to project.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.
- D. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.
 1. Obtain Utility company approval of shop drawings prior to submittal.
- E. Drawings prepared by Utility Company.
- F. Project Record Documents: Record actual locations of equipment and installed service routing.

1.07 QUALITY ASSURANCE

- A. Comply with the following:
 1. IEEE C2 (National Electrical Safety Code).
 2. NFPA 70 (National Electrical Code).
 3. The requirements of the Utility Company.
 4. The requirements of the local authorities having jurisdiction.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

- A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
- B. Electrical Service Characteristics: As indicated on drawings.
- C. Utility Company: Eversource.
- D. Division of Responsibility:
 - 1. Pad-Mounted Utility Transformers:
 - a. Transformer Pads: Furnished and installed by Contractor per Utility Company requirements.
 - b. Transformers: Furnished and installed by Utility Company.
 - c. Transformer Grounding Provisions: Furnished and installed by Contractor per Utility Company requirements.
 - d. Transformer Protective Bollards: Furnished and installed by Contractor per Utility Company requirements.
 - e. Primary:
 - 1) Trenching and Backfilling: Provided by Contractor.
 - 2) Conduits: Furnished and installed by Contractor.
 - 3) Conductors: Furnished and installed by Utility Company.
 - f. Secondary:
 - 1) Trenching and Backfilling: Provided by Contractor.
 - 2) Conduits: Furnished and installed by Contractor.
 - 3) Conductors: Furnished and installed by Contractor (Service Point at transformer).
 - 2. Terminations at Service Point: Provided by Utility Company.
 - 3. Metering Provisions:
 - a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.
 - b. Metering Transformer Cabinets: Furnished and installed by Contractor per Utility Company requirements.
- E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Verify and mark locations of existing underground utilities.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
- B. Perform work in accordance with NECA 1 (general workmanship).

- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required trenching and backfilling in accordance with Section 31 2316.13.
- E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 03 3000.
- F. Provide required protective bollards in accordance with Utility Company requirements.
- G. Provide required support and attachment components in accordance with Section 26 0529.
- H. Provide grounding and bonding for service entrance equipment in accordance with Section 26 0526.
- I. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 0553.

END OF SECTION

SECTION 26 2413
SWITCHBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.
- B. Overcurrent protective devices for switchboards.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 2100 - Low-Voltage Electrical Service Entrance.
 - 1. Includes Utility Company contact information.
- F. Section 26 2713 - Electricity Metering: For interface with equipment specified in this section.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).
- B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- F. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.
- G. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- L. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- M. UL 891 - Switchboards; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
 5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Service Entrance Switchboards:
1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
 2. Coordinate with City of Hartford to arrange for Utility Company required access to equipment for installation and maintenance.
 3. See Section 26 2100 for Utility Company contact information and additional requirements.
 4. Obtain Utility Company approval of switchboard prior to fabrication.
 5. Preinstallation Meeting: Convene one week prior to commencing work of this section to review requirements with Utility Company representative.
 6. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 4. Include documentation of listed series ratings upon request.
 5. Include documentation demonstrating selective coordination upon request.
 6. Identify mounting conditions required for equipment seismic qualification.
- D. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.
- E. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 2 as production (routine) tests.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Field Quality Control Test Reports.
- H. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.
- B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.
- C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Switchboards - Basis of Design: Schneider Electric.
- B. Switchboards - Other Acceptable Manufacturers:
 - 1. ABB/GE: www.geindustrial.com.
 - 2. Eaton Corporation: www.eaton.com.
 - 3. Schneider Electric; Square D Products: www.schneider-electric.us. - Basis of Design
- C. Substitutions: See Section 01 6000 - Product Requirements.
- D. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.
- E. Source Limitations: Furnish switchboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 SWITCHBOARDS

- A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

- D. Front-Connected Switchboards:
 - 1. Main Device(s): Individually-mounted.
 - 2. Feeder Devices: Panel/group-mounted.
 - 3. Arrangement: Front accessible only (not rear accessible), rear aligned.
 - 4. Gutter Access: Bolted covers.
- E. Service Entrance Switchboards:
 - 1. Listed and labeled as suitable for use as service equipment according to UL 869A.
 - 2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
 - 3. Comply with Utility Company requirements for electrical service.
 - 4. Utility Metering Provisions: Provide separate barriered compartment complying with Utility Company requirements where indicated or where required by Utility Company. Include hinged sealable door and provisions for Utility Company current transformers (CTs), potential transformers (PTs), or potential taps as required.
- F. Service Conditions:
 - 1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
 - a. Altitude: Less than 6,600 feet.
 - b. Ambient Temperature:
 - 1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F and 104 degrees F.
 - 2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- G. Short Circuit Current Rating:
 - 1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Minimum Rating: 65,000 rms symmetrical amperes.
- H. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- I. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.
- J. Bussing: Sized in accordance with UL 891 temperature rise requirements.
 - 1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
 - 2. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
 - 3. Phase and Neutral Bus Material: Aluminum.
 - 4. Ground Bus Material: Aluminum.
- K. Conductor Terminations: Suitable for use with the conductors to be installed.
 - 1. Line Conductor Terminations:
 - a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - b. Main and Neutral Lug Type: Mechanical.
 - 2. Load Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

- b. Lug Type:
- L. Enclosures:
 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 2. Finish: Manufacturer's standard unless otherwise indicated.
- M. Future Provisions:
 1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- N. Instrument Transformers:
 1. Comply with IEEE C57.13.
 2. Select suitable ratio, burden, and accuracy as required for connected devices.
 3. Current Transformers: Connect secondaries to shorting terminal blocks.
 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Circuit Breakers:
 1. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
 2. Molded Case Circuit Breakers:
 - a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 1) Provide electronic trip circuit breakers where indicated.
 - b. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
 - 1) Provide the following field-adjustable trip response settings:

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive switchboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.
- C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.

- D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.
- E. Provide required support and attachment in accordance with Section 26 0529.
- F. Install switchboards plumb and level.
- G. Unless otherwise indicated, mount switchboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 3000.
- H. Provide grounding and bonding in accordance with Section 26 0526.
- I. Install all field-installed devices, components, and accessories.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Set field-adjustable circuit breaker tripping function settings as indicated.
- L. Provide filler plates to cover unused spaces in switchboards.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's reports with submittals.
- C. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.
- D. Inspect and test in accordance with NETA ATS, except Section 4.
- E. Perform inspections and tests listed in NETA ATS, Section 7.1.
- F. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
- G. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.
- H. Correct deficiencies and replace damaged or defective switchboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of switchboard covers and doors.

3.05 CLEANING

- A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred surfaces to match original factory finish.

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Lighting and appliance panelboards.
- B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).
- F. NEMA PB 1 - Panelboards; 2011.
- G. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- L. UL 67 - Panelboards; Current Edition, Including All Revisions.
- M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- O. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 4. Include documentation of listed series ratings upon request.
 5. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
- F. Field Quality Control Test Reports.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- I. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.geindustrial.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Substitutions: See Section 01 6000 - Product Requirements.
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Label equipment utilizing series ratings as required by NFPA 70.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.

2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.
1. Ampere Rating: Not less than ampere rating of panelboard bus.
 2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.
 3. Coil Voltage: As required for connection to control system indicated.
- K. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 2. Phase and Neutral Bus Material: Aluminum.
 3. Ground Bus Material: Aluminum.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.

- b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
- 3. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
 - b. Provide interchangeable trip units where indicated.
- 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
- 6. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

2.05 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 0529.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 26 0526.

- K. Install all field-installed branch devices, components, and accessories.
- L. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- M. Provide filler plates to cover unused spaces in panelboards.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1. Tests listed as optional are not required.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Receptacles.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0533.16 - Boxes for Electrical Systems.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- D. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- E. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Field Quality Control Test Reports.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual installed locations of wiring devices.

1.05 QUALITY ASSURANCE

- A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Products: Listed, classified, and labeled as suitable for the purpose intended.

- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

2.02 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com/#sle.
 - 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 - 3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 - 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
 - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 - 2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
 - 1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 - a. Provide test and reset buttons of same color as device.
 - 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
 - 3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- I. Install wall switches with OFF position down.
- J. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- K. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- L. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.

- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Excavation and disposal of existing materials, and earth excavation for trenches, construction of roads, foundations, walls, concrete paving, curbs, drainage, rain gardens, lawn, planting areas and other work.; backfilling and compacting excavations and trenches; furnishing necessary material; compaction; furnishing material for and constructing fill areas, embankments; miscellaneous earth excavations and miscellaneous grading.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to work of this Section.
- B. All related Specification Sections shall be used in conjunction with this Section.

1.3 RELATED WORK:

- A. Division 02 Section "Maintenance and Protection of Traffic"
- B. Division 31 Section "Site Preparation and Demolition"
- C. Division 31 Section "Site Backfill"
- D. Division 31 Section "Erosion and Sediment Controls"
- E. Division 32 Section "Bituminous Asphalt Concrete Paving"

1.4 EXCAVATION CLASSIFICATIONS

- A. Earth excavation or "excavation" consists of removal of materials encountered to the subgrade elevations indicated and subsequent reuse or disposal of the materials removed. All excavation is classified as earth excavation unless it otherwise meets the classifications provided below for unauthorized excavation, additional excavation, or rock excavation.
- B. Unauthorized Excavation:
 - 1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at Contractor's expense.
- C. Additional Excavation:

1. When excavation has reached required subgrade elevations, notify the Engineer who will make an inspection of conditions.
2. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by the Engineer.
3. Removal of unsuitable material as directed and its replacement with suitable material will be paid for under the unit rate bid for this classification.

D. Trench Excavation:

1. For classification of trench excavation see Item 3.13 – Trenching.

1.5 SUBMITTALS

- A. General: Refer to Division I for Submittal Requirements.
- B. Laboratory and field test results including existing topsoil analysis, soil gradation, Modified Proctor, and compaction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Subsoil Suitable for Reuse: Material used for general filling outside of limits of pavements may be either approved material available from excavation on-site or approved material, obtained from off-site, certified to conform to the following grain-size gradation:

| <u>Square Mesh Sieve</u> | <u>% Passing (by Weight)</u> |
|--------------------------|------------------------------|
| 3 ½" | 100 |
| 2" | 90 |
| ¼" | 30-80 |
| #40 | 5-30 |
| #100 | 0-15 |

It shall be clean, free of clay and organic material and capable of satisfactory compaction. If sufficient approved on-site material is not available to meet grading requirements indicated, Contractor shall provide additional approved off-site material at no extra cost to Owner.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the site and all work prepared by others and report to the Owner in writing any conditions detrimental to the proper and timely completion of work until unsatisfactory conditions have been corrected in an acceptable manner.

- B. Verify stockpiled fill to be reused is approved.
- C. Verify areas to be backfilled are free of debris, snow, ice or water, and ground surfaces are not frozen.

3.2 GENERAL

- A. Erosion Protection: Prevent erosion on open cut slopes and beams at all times.
- B. Construction Traffic: Disperse travel paths of traffic and construction equipment over entire width of compacted surfaces to aid in obtaining uniform compaction. Protect exposed soil layers with high moisture content from excessive wheel loads.
- C. Use of Materials Found on the Site:
 - 1. It is anticipated that some existing on-site materials may be suitable for use as fill material. If deemed suitable by the Geotechnical Engineer, the on-site material shall be placed and compacted in a manner conforming to the applicable specifications for backfill and fill material.
 - 2. All unsuitable material, and suitable material not required for the proper completion of the Contract, will become the property of the Developer and shall be removed and properly disposed of away from the jobsite at no additional cost to the Owner.
 - 3. Do not excavate or remove any material from the site or right-of-way, which is not within the excavation, as indicated in the Drawings, without written authorization from the Owner.
- D. Stockpiling of Material: Establish material stockpiles on site only at locations which will not interfere with the progress of the work. Such off-site stockpiling shall require written permission from the Owner. Place, grade, and shape stockpiles for proper drainage. Place erosion controls as required. Off-site stockpiling and re-handling, if required shall be the responsibility of the Contractor, at no additional expense to the Owner.
- E. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
- F. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill off-site in a legal manner at no expense to the Owner.
- G. Excess material may be generated as a result of excavations and grading. All excess material shall be disposed of legally off-site at the Contractor's expense.
- H. Site areas requiring new fill shall be stripped of all topsoil, organics, and soft yielding material prior to the depositing of fill material.
- I. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding the project site and surrounding area. The Contractor

shall not convey water to any area outside the project limits.

J. Unfavorable Weather:

1. Fill and backfill materials shall not be placed on snow, ice, frozen subgrades or un-compacted frozen soil.
2. Fill and backfill materials shall not be frozen when placed or be allowed to freeze prior to compaction. At the end of each day's work during freezing weather, the last lift of fill, after compaction, shall be rolled by a smooth-wheeled roller to eliminate ridges of un-compacted soil. The Contractor shall suspend backfilling operations when air temperatures are below 32 degrees F, if so directed by the Geotechnical Engineer.
3. Do not excavate to full indicated depth when freezing temperatures may be expected, unless slabs are poured immediately after the excavation has been completed. Protect the excavation from frost if placing of concrete is delayed. Concrete for foundations or slabs shall not be placed on frozen soil.
4. Soil bearing surfaces below completed slabs and foundations shall be protected against freezing. Frost protection shall be provided in a manner acceptable to the Architect as soon as practicable after slabs/foundations are constructed.
5. Wet Weather: If fill material placement, spreading, rolling or compaction operations are interrupted by heavy rain or other unfavorable conditions, do not resume such operation until ascertaining that the moisture content and density of the previously placed soil are as required by these specifications.

K. Bracing, Sheeting and Shoring

1. Provide all bracing, sheeting and shoring, where necessary to retain the sides of excavations and to prevent movement or settlement or adjacent structures, utilities, piping, conduit, roads and streets, etc. The Contractor shall be entirely responsible for the strength and adequacy of all such bracing, sheeting and shoring, and shall, if required, submit fully detailed shop drawings for review. The Contractor is solely and entirely responsible for the safety and support of such structures, utilities, etc., and is liable for any damage or injury caused by or resulting from any such movement or settlement.
2. Issue any notices to Owner of adjoining property, which may be required by any pertinent laws or ordinances. Furnish copies of such notices to the Owner.
3. Refer to Section 314100 Excavation Support.

3.3 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known underground utilities. Stake and flag locations.
- C. Identify and flag surface and aerial utilities.

- D. Notify the appropriate utility authority to remove and relocate utilities.
- E. Maintain and protect existing utilities remaining which pass through work area.

3.4 PROTECTION

- A. Protect trees, shrubs, lawns, and other features remaining as a portion of final landscaping.
- B. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from equipment and vehicular traffic.
- C. Protect above and below grade utilities which are to remain.
- D. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- E. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- F. Notify Engineer of unexpected subsurface conditions such as rock if encountered. Discontinue affected work in area until notified to resume work.
- G. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- H. Grade excavation top perimeter to prevent surface water runoff into excavation.
- I. Maintain bottom of all excavations stable, dry and free of water on a 24-hour basis.

3.5 EXCAVATION

- A. Excavate topsoil and subsoil required for underground structures, construction operations, and other work.
- B. Remove all muck, peat and other unsuitable bearing material from areas where structures are to be located. If unsuitable material exists at limits of excavation shown on Drawings, obtain approval of Engineer prior to removal of material. Unauthorized excavation of unsuitable material will not be considered for payment.
- C. Machine slope banks to angle of repose or less until shored.
- D. Excavation generally shall not interfere with normal 45° bearing splay of any foundation.
- E. Hand trim excavation and leave free of loose matter.
- F. Correct unauthorized excavation at no additional expense to the Owner with material approved by the Engineer.
- G. Fill over-excavated areas under structure bearing surfaces with structural fill in accordance with

direction by the Engineer.

- H. Stockpile excavated material to be reused in area designated on site and remove excess or unsuitable subsoil not being reused from site.
- I. Maintain bottom of all excavations stable, dry and free of water on a 24-hour basis.
- J. Excavate to the lines and grades indicated, and deeper as required to reach suitable bearing soil as judged by the Geotechnical Engineer. The excavation shall be made deeper in areas where the subgrade is judged by the Geotechnical Engineer to have inadequate bearing capacity.
- K. Conduct unclassified excavation using appropriate methods and equipment in sufficient quantity and sizes to perform the work as specified and as shown on the Drawings.
- L. Adhere to specified restrictions for excavation and removal of buried structures.
- M. Carry out excavation in such a manner that damage to adjacent roads, structures and utilities is prevented.
- N. Control the inflow of water into excavations by acceptable construction de-watering methods and procedures. Control the inflow of water to prevent loss of materials from outside the limits of excavation.
- O. Prevent disturbance to all soil subgrades.
- P. Remove unsuitable and excess suitable excavated material from the excavation and site promptly. Do not stockpile excavated material immediately outside the site limits. Surplus and unsuitable materials shall be hauled away and disposed of at no additional cost to the Owner.
- Q. Limits of the excavation shall allow for adequate working space for installing forms and as required for safety of personnel.
- R. Remove unstable bottom material. Remove large stones, boulders, debris and unsuitable soil from excavation bottoms.
- S. Excavation for the convenience of the Contractor shall conform to limits acceptable to the Geotechnical Engineer and shall be at no additional expense to the Owner.
- T. Contractor shall provide 8-inches of 3/8" crushed stone at bottom of excavations in water.

3.6 SUBSURFACE OBSTRUCTIONS

- A. All buried structures shall be removed in confined excavations as general excavation proceeds. Do not excavate for buried structure removal below subgrade elevations unless otherwise directed by the Geotechnical Engineer.
- B. Buried structures which extend below foundation subgrade elevations shall be cut off and left in place below the subgrade elevation, except as directed by the Geotechnical Engineer. If the buried structures directly interfere with a foundation support location, immediately notify the

Geotechnical Engineer who will determine whether the buried structures should be removed or left in place. The Contractor will be paid for removal of buried structures encountered below subgrade elevations only when removal of the buried structures is directed by the Geotechnical Engineer.

- C. Buried structures below subgrade elevations which are removed by the Contractor without being directed by the Geotechnical Engineer to do so shall be backfilled with lean concrete or properly compacted granular fill, unless otherwise directed by the Geotechnical Engineer, at no additional cost to the Owner.

3.7 EXCAVATION FOR STRUCTURES

- A. Excavation for buildings shall be done to provide proper bearing for structures, to produce the proper grade and dimensions for finished construction, and in a satisfactory manner.
- B. Excavation related to the building shall be to the full depth required to provide suitable bearing material.
- C. All traces of peat, loam or other unsuitable materials shall be fully removed.
- D. Site preparation and other construction activities shall be conducted in a manner so as to minimize the disturbance of clay soils to remain in place, where applicable.

3.8 FIELD QUALITY CONTROL

- A. All subgrades must be observed and approved by the Engineer prior to fill placement. Sufficient time must be given to the Engineer to observe and perform any necessary tests on the subgrade.
- B. The Contractor shall provide all offsets and other construction reference points necessary to establish and maintain location and elevation of all proposed improvements as shown on the Drawings and as field approved by the Owner's Representative during construction.
- C. The Contractor, at his own expense, shall do all engineering required for establishing grades, lines, levels, dimensions and reference points for all trades; shall be responsible for maintaining bench marks and other survey marks, and shall replace as directed, any bench marks which have been disturbed or destroyed.
- D. The Contractor shall compare all grades, lines, levels and dimensions as shown on the Drawings and actual site conditions, and shall promptly report to the Owner, before commencing work, any inconsistencies he may discover.

3.9 NOTIFICATION

- A. When ledge rock or boulders are encountered, the material shall be uncovered and the Engineer notified. The Contractor shall be responsible for and provide the Engineer with cross sections of the ledge rock surface. The Engineer shall be notified in advance as to when the cross section of ledge is to be made.

If the Contractor uncovers ledge, but fails to notify the Engineer, the Contractor shall have no right of claim to any classification other than that allowed by the Engineer.

- B. The average end area method shall be used in the computation of volumes wherever practicable.

3.10 LIMITS OF EXCAVATION IN ROCK

- A. Excavation in rock shall be performed, unless otherwise indicated on the Plans directed, so that no projection shall come within vertical planes 12 inches outside of the structure being built, 12 inches below the bottom of the structure base slab and footings, or as shown on the Drawings. In trenches, the rock shall be removed to the limits shown on the typical trench section. Where excavation is carried beyond the above determined limits, the additional space shall be refilled at the Contractor's expense with concrete or other selected material, as directed by the Engineer.

3.11 REMOVAL OF ROCK

- A. No blasting will be allowed on this project.
- B. Perform rock excavation in a manner that will produce material of such size as to permit it being placed in embankments in accordance with Section 02300. Remove rock to limits indicated. Remove loose or shattered rock, overhanging ledges and boulders which might dislodge.
- C. Rock Excavation - Mechanical Method:
 1. Excavate for and remove rock by mechanical method. Drill holes and utilize expansive tools and wedges to fracture rock.
 2. Cut away rock at excavation bottom to form level bearing. Remove shaled layers to provide sound and unshattered base for foundations.
 3. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.
 4. Remove shaled layers to provide sound unshattered base for footings and foundations.
 5. Re-use excavated rock materials on-site in accordance with Section 02300.
 6. Remove excavated rock materials not re-used off-site.
- D. Use lean concrete or suitable materials to replace rock overblast or overexcavation in building area and in expansion area to facilitate placement of utilities and future footings.

3.12 DISPOSAL AND REPLACEMENT OF ROCK

- A. Rock shall be considered unsuitable for backfilling and removed from the site.
- B. Rock and boulders shall be replaced at no additional expense to the Owner with suitable

material as specified above.

- C. If rock below limits of excavation is shattered by blasting, caused by holes drilled too deep, or too heavy charges of explosives, or any other circumstance due to blasting, and if such shattered rock does not provide suitable foundation, the rock shall be removed and the excavation refilled with gravel at the expense of the Contractor. The gradation of gravel shall be as specified above.

3.13 TRENCH EXCAVATION

- A. Trench excavation shall conform to Section 2.05.03 of the Form 818 Standard State Specifications.
- B. Cut trenches sufficiently wide to allow for installation and jointing of the pipe, placement and compaction of the bedding material under and around the pipe and inspection of the work. Slope banks to angle of repose or install shoring where needed.
- C. Excavate trenches to depth indicated or required to establish indicated slope and invert elevations.
- D. Unless otherwise shown, separate trenches for each utility shall be provided. Maintain ready access for fire-fighting apparatus.
- E. Remove within trench limits shown on the typical trench section muck, peat or other unstable material which in the opinion of the Engineer is incapable of supporting pipe.
- F. Correct unauthorized excavation at no cost to Owner. Backfill with material approved by the Engineer.
- G. Stockpile excavated material in area designated on site and remove unsuitable subsoil or excess subsoil not being reused, from site.
- H. Hand trim excavation and leave free of loose matter.
- I. Maintain all trench excavation stable, dry and free of water on a 24-hour basis during excavation, pipe placement and backfilling. All necessary well pointing and/or pumping shall be performed and maintained at the Contractor's expense.
- J. Grading trench bottoms: The bottom of the trenches shall be graded evenly to insure uniform bearing for full length of all pipes. Excavate to at least 4" below the pipe.

3.14 REPLACEMENT OF UNSUITABLE MATERIAL

- A. Replacement of unsuitable material such as muck, peat, trash, rock, boulders or organics during trenching for pipelines:
 - 1. Above the blanket material and within the trench limits defined on the Drawings, and/or as directed by the Engineer, unsuitable material shall be replaced with common fill placed in 12-inch lifts and compacted to 95%.

2. Below the blanket material and within the trench limits defined on the Drawings, and/or as directed by the Engineer, unsuitable material shall be replaced with gravel placed in 12-inch lifts and compacted to 95%.

3.15 BACKFILLING TRENCHES

- A. When necessary, compact subgrade surfaces to density requirements for backfill material.
- B. Place and compact trench backfill in accordance with Article 6.51.03 of the Form 818. Coordinate backfilling with required utilities testing.
- C. Support pipe and conduit during placement and compaction of bedding and fill.
- D. Bedding shall consist of 6 inches crushed stone for PVC and polyethylene corrugate pipe and 6 inches of sand for ductile iron pipe.
- E. Cover ductile iron pipe to 12 inches over crown with sand blanket.
- F. Cover polyvinyl chloride and polyethylene corrugate pipe to 12 inches over crown with crushed stone or as indicated on plans.
- G. For reinforced concrete pipe and corrugated metal pipe, firm trench bottom for its full length and width. Shape trench to fit pipe for a depth of not less than 10% of its total height. Dig troughs to accommodate bell.
 1. If ledge rock, rocky soil, hard pan or other unyielding foundation material is encountered at the normal grade of the culvert bed, excavated to 12 inches below invert grade and 1 foot on each side of the interior face of the pipe wall and refill with compacted gravel.
- H. Cover reinforced concrete pipe with common fill. Do not allow stones in excess of 3 inches in diameter to be placed in contact with pipe.
- I. Backfill trenches to required contours and elevations. Backfill systematically, as early as possible, to allow maximum time for natural settlement.
- J. Place and compact bedding and blanket in continuous layers not exceeding 12 inches loose depth. Place and compact bedding course on rock and other underlying bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Hand trim for bell and spigot pipe joints
- K. Place and compact common fill in continuous layers not exceeding 12 inches loose depth.
- L. Maintain optimum moisture content of backfill materials to attain required compaction density.
- M. Remove surplus backfill materials as directed by Engineer.
- N. Leave stockpile areas completely free of excess fill materials.
- O. All bedding and backfill materials to be compacted to 95% of maximum density as computed

using ASTM D 1557 Modified Proctor.

- P. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- Q. Where pipe 48 inches or less in diameter is to be laid in an embankment area, construct embankment to a height of 2 feet over the crown of the pipe, or to subgrade, whichever is lower, and excavate trench as indicated in paragraph A.

3.16 SUBGRADE PREPARATION AND PROTECTION

A. General:

1. Complete the excavations to the required subgrade elevations allowing for subbase material, bedding layers, plus any additional depth required to accommodate particular requirements.
2. All subgrades must be observed and accepted by the Geotechnical Engineer prior to proof-rolling or placement of Compacted Granular Fill or any structure over subgrades.
3. Remove any additional materials below subgrade elevations, which are unsuitable where directed by the Geotechnical Engineer.
4. Proof-roll the exposed subgrade with a minimum 10-ton vibratory roller for a minimum of four (4) passes or as required by the Geotechnical Engineer.
5. Where directed by the Geotechnical Engineer, backfill all holes or voids encountered outside of minimum excavation limits with Compacted Granular Fill in layers not exceeding nine (9) inches measured before compaction and compact to 95 percent of maximum dry density (ASTM D1557) using appropriate compaction equipment.

3.17 PLACEMENT AND COMPACTION OF MATERIALS

A. General

1. Notify Owner's Representative when excavations have reached required subgrade elevations. When the Owner's Representative determines that unforeseen unsatisfactory soil is present as defined earlier, continue excavation and place with compacted granular fill material as directed.
2. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Owner's Representative at no additional cost to the Owner.
3. Backfills of the various types specified shall be placed and compacted within the limits and to the thickness indicated on the Drawings unless otherwise specified.
4. All backfill material shall be placed "in-the-dry" on subgrades acceptable to the Geotechnical Engineer. The Developer shall pump to remove water from within

excavated areas on subgrade surfaces as required to perform the work, and in such a manner as to preserve the undisturbed state of the approved subgrade material.

5. The Contractor shall not place a layer of compacted fill on snow, ice, or soil that was permitted to freeze prior to compacting. Removal of these unsatisfactory materials will be required as directed by the Owner.
 6. Compacted fill shall not be placed when temperatures are below freezing.
 7. Processed Subbase for bituminous concrete pavements shall be placed in two courses and shall be in accordance with Section 3.04 of the CONNDOT Specification 817.
 8. Under footings, foundation bases or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete may be used to bring elevations to proper position, when acceptable to Owner's Representative.
 9. Under structures, building slabs and steps, and pavements, compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.
 10. Place backfill materials evenly adjacent to structures to required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately the same elevation in each lift.
 11. Do not place any fill against retaining walls until concrete has sufficiently set to withstand pressure. Bulldozer, trucks, rollers and other mechanical equipment used in placement and compaction of backfill are expressly prohibited from approaching within 8 feet of walls unless protective measures are taken to insure transfer of loads away from walls.
 12. Placement of all specified fill and backfill materials shall be systematically conducted in the specified uniform layer thicknesses.
 13. Measurement of backfill layer or lift thickness shall be conducted in all cases prior to compaction.
 14. Compaction of backfill materials shall be conducted with a minimum of four (4) complete coverages with acceptable compaction equipment and to at least the minimum specified density, which is expressed as a percentage of maximum dry density as determined by ASTM D1557.
- B. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Acceptance by the Geotechnical Engineer of construction below finish grade including, where applicable, damp-proofing, waterproofing, utility placements, etc.
 2. Completion of quality control testing, acceptance by the Geotechnical Engineer and recording locations of underground utilities.

3. Removal of concrete formwork unless formwork is specified to remain in place.
 4. Removal of temporary excavation support elements and backfilling of voids with materials acceptable to the Geotechnical Engineer.
 5. Removal of trash and debris.
 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
- C. Compaction Equipment:
1. In all cases, the Developer shall only use compaction equipment, which is deemed acceptable by the Geotechnical Engineer.
 2. Compaction in open areas shall be conducted with heavy equipment such as vibratory rollers weighing at least 15,000 lbs., or by other acceptable equipment.
 3. Compaction in confined areas (against walls, footings, piers and in trenches) shall be conducted with acceptable equipment such as hand-guided vibratory compactors or tampers.
- D. Control of Moisture: The amount of moisture in any one layer of backfill material shall be as uniform as practicable throughout.
1. The upper limit of water content in materials shall be that which will permit handling and placing and will permit proper compaction with the Developer's equipment. In no case shall the water content during compaction exceed a value of two (2) percentage points on the wet side of optimum water content as determined by ASTM D1557.
 2. The lower limit of water content shall not be less than two (2) percentage points below optimum water content. Material, which is too wet, shall be spread and permitted to dry, assisted by mechanical agitation, if necessary, until the water content is reduced to a value within the specified limits. Each layer of material, which is too dry, shall be sprinkled with water, and the water worked into the material by mechanical methods until a uniform distribution of moisture is obtained. Water applied to a layer of material shall be accurately controlled in amount so that free water will not appear on the surface during or subsequent to compaction.
- E. Backfill and Fill Materials:
1. Place in layers not to exceed eight (8) inches when utilizing heavy compaction equipment and in four (4) inch layers when utilizing light hand operated compaction equipment.
 2. Compact each layer of fill to the maximum dry density, percentage of ASTM D1557 indicated below or as directed by the Geotechnical Engineer.
 - a. Paved areas - 95 percent
 - b. Grassed Areas - 90 percent

F. Granular and Stabilized Subbase Materials:

1. Place in layers not to exceed six (6) inches when utilizing heavy compaction equipment and four (4) inches when utilizing light hand operated compaction equipment.
2. Procedures for placing granular fill and backfill shall conform to Form 818 Section 2.16. Granular fill and backfill shall be compacted to 95% modified proctor density as defined by ASTM D1557.
3. Place a minimum six (6) inch thickness below slabs-on-grade and paving slabs.
4. Subgrade beneath Granular fill should be compacted to 95% modified proctor density. Compact subgrade in accordance with Articles 2.09.03.
5. Compact Granular Fill to at least 95 percent of maximum dry density.

3.18 GRADING AND COMPACTING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with the compaction requirements and grade to profiles, lines and elevations shown on the plans. Provide a smooth transition between existing adjacent grades and proposed grades. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
- B. Site grading: Slopes 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
 4. Grading inside building lines: Plus or minus 1/4 inch when tested with a 10-foot straightedge.
- C. Fine Grading and Compacting: Shape the subgrade to a fine surface conforming to the indicated cross section, and compact fill material to the maximum dry density specified. Cut down all high spots, fill depressions and re-compact until the surface is smooth and satisfactorily compacted.
- D. Grading and Finishing: In areas designated for grading and finishing, rake or machine-grade the areas to remove stones over two inches and other unsatisfactory material; fill depressions and finish the surface within the indicated tolerances.

3.19 PLACEMENT OF GRANULAR AND STRUCTURAL FILL MATERIALS

- A. Gravel and structural fill shall be a minimum of 8" deep and shall extend to undisturbed soil at all locations.

- B. Installation shall be in layers no more than 8" deep for material compacted by 10-ton vibratory rollers and not more than 4" deep for material compacted by hand-operated tampers.
- C. Material shall be compacted to a minimum of 95% optimum density as determined by the laboratory tests. All areas not meeting the required density shall be recompacted, at the Contractor's expense, until the required density is achieved.
- D. Granular and structural fill shall be placed in the following locations:
 - 1. Beneath slabs on grade within building area
 - 2. Beneath exterior equipment slabs and entrance platforms
 - 3. All other areas specifically noted on the drawings
- E. When a compacted drainage course is indicated to be 8 inches thick or less, place material in a single layer. When indicated to be more than 8 inches thick, place material in less than 6 inches in thickness when compacted. Each layer shall be compacted to 95% of modified optimum density as achieved by AASHTO Method T180.
- F. Gravel and structural fill shall be compacted at moisture content, which will allow proper compaction. Gravel and structural fill shall not be placed where standing water is present.
- G. Gravel and structural fill shall be recompacted where disturbed by installation of pipes, conduits, etc. Compaction shall be performed so as not to damage the installed items. The excavation and recompaction described above is included in the Contract.
- H. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation, provide final grades within a tolerance of 1/2 inch when tested with a 10-foot straightedge.
- I. Protect all compacted gravel and structural fill from saturation with excess moisture and from freezing. Any material that loses its required density due to excess moisture or freezing shall be removed, replaced, and compacted at the Contractor's expense.
- J. Do not backfill against foundation walls until walls have been adequately braced. Where backfill occurs on both sides of wall, keep levels of fill equal on each side at all times.

3.20 COMPACTION TESTING

- A. Compaction testing will be performed in accordance with ASTM D 1556, or D 2922 and the General Conditions.
- B. If tests indicate work does not meet specified requirements, remove work and replace at no cost to Owner.

3.21 TOLERANCES

- A. Top Surface of Backfilling: Plus or minus one inch.

3.22 HAZARDOUS MATERIAL AND WASTE CONTROL

- A. Excavation and disposal of contaminated, polluted or “environmentally compromised” materials shall be conducted in conformance with the environmental and abatement specifications. The handling of contaminated, polluted or “environmentally compromised” water to be discharged as a result of dewatering shall be performed in accordance with the environmental and abatement specifications. The Contractor is responsible for all additional testing, cost and schedule associated with the disposal facility selected by the Contractor.

END OF SECTION 312300

SECTION 312319

DEWATERING

PART 1 - GENERAL

1.1 SYSTEM PERFORMANCE REQUIREMENTS

- A. Dewatering shall include all necessary control and disposal of groundwater on a 24-hour basis during construction.
- B. Dewatering shall include the lowering of the groundwater table to relieve any hydrostatic head that could cause a decrease in the stability of the excavated subgrade. It shall also include the intercepting of seepage which could otherwise emerge from the slope or sides of excavations which could cause a decrease in the stability of the excavated subgrade or the slopes or sides of the excavations.
- C. Dewatering shall be performed during construction to temporarily protect against the following:
 - 1. The loss of any material beneath the excavated subgrade or from the slopes or sides of the excavations or the movement of any fine particle materials from the soil.
 - 2. Any increased vertical or lateral loads on the excavation support systems.
 - 3. Any disturbance, rupture, instability, boiling or heaving of the bottom of excavated subgrade during:
 - a. Excavation.
 - b. Placement of foundation or bedding materials.
 - c. Construction of slabs, footings, pipes, conduits, underdrains and any other structures.
 - d. Backfilling operations.
- D. The Contractor is forbidden from discharging water collected from the dewatering operations directly into wetlands and/or watercourses. As a result, the Contractor shall provide for methods, materials and construction, to be approved by the Engineer and Owner, for collection and treatment of the dewatering operations discharge(s). At a minimum, these methods will include conveying the discharged water through a sedimentation basin, appropriately sized for the operation, and described in Section 312500.

If, in the sole opinion of the Engineer, the sedimentation system is inadequate, the contractor shall be required to provide dual compartment septic tankage, appropriately sized for the operation, to which the dewatering water shall be directed, followed by the sedimentation pond(s).

In no case will discharge containing visible sediment, or other pollutants be allowed to dis-

charge to wetlands or watercourses. The proposal for treating the dewatering discharge water shall be prepared by a Connecticut Registered Professional Engineer.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to work of this Section.
- B. All related specification sections shall be used in conjunction with this section.
- C. ConnDOT Form 818.

1.3 ADDITIONAL PROVISIONS

- A. Provide, operate and maintain any dewatering system required to lower and control groundwater levels and groundwater hydrostatic pressure during the construction of the Work, as required by this Section and the Contract Documents with no additional time allowed for the completion of the Work.
- B. Remove and dispose of water resulting from activities described in 1.1 C and 1.2 A and C above.
- C. Remove dewatering systems and equipment when no longer required.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. The Contractor shall submit plans for proposed dewatering system to the Engineer for review.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 GENERAL

- A. The dewatering system shall be capable of developing an excavated subgrade relieved of any hydrostatic pressure that could cause a decrease in the stability of the excavated subgrade and which will provide the necessary groundwater control for the proper performance required for completion of the Work.
- B. The dewatering system shall not cause damage to newly constructed or existing properties, buildings, utilities and other work due to the loss of ground or support from incompletely drained soils or from removal of soil particles caused by the dewatering system.

- C. Dewatering facilities shall be located only where they will not cause interference with work performed by others.
- D. If the dewatering system utilized by the Contractor causes or threatens to cause damage to new or existing facilities, the dewatering system shall be removed and/or modified at no additional expense to the Owner.
- E. Dispose of subsurface water collected in a manner which conforms to all applicable local and state ordinances, statutes and laws as well as Section 1.1 C above.
- F. Maintain continuous and complete effectiveness of the installation at all times.
- G. Provide dewatering necessary to maintain the groundwater table a minimum of 2 feet below the bottom of excavated subgrade or the prevailing level of backfill as it is being placed. The groundwater table shall also be maintained at a level which will not result in uplift pressure in excess of 80% of the downward pressure produced by the weight of the structure and any backfill in place.

3.2 JOB CONDITIONS

- A. Erosion Control: The Contractor shall provide adequate protection from erosion from any of the dewatering operations utilized during the course of the construction. Any damage, disruption or interference to newly constructed work or existing properties, building, structure, utilities and/or other work resulting directly or indirectly from dewatering operations conducted under this Contract shall be remedied by the Contractor to the satisfaction of the Engineer, at no cost to the Owner.
- B. Treatment of Dewatering Operations Discharges: It shall be the responsibility of the Contractor to provide such additional treatment as may be required to meet the provisions of the Contract. This may include the construction of sumps and/or settling basins, stone rip rap, silt fences or other the noted septic tankage requirements. They shall be provided and later removed and/or filled in with acceptable backfill material once they are no longer needed at no additional expense to the Owner.

END OF SECTION 312319

SECTION 31 23 23

SITE BACKFILL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Provide all labor, materials and equipment necessary to perform site related backfilling operations shown on the Drawings, described herein, or reasonably inferable from either or both.
- B. Include performing backfilling for embankments, and consolidation and compaction.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to work of this Section.
- B. All related specification sections shall be used in conjunction with this Section.

1.3 REFERENCES, STANDARDS, CODES AND REGULATIONS

- A. Conform to the latest editions of the following, unless otherwise specified herein:

| | |
|------------|---|
| ASTM C136 | Method for Sieve Analysis of Fine and Coarse Aggregates |
| ASTM D1556 | Test Method for Density of Soil in Place by the Sand-Cone Method |
| ASTM D1557 | Test methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures using 10 Lb. Hammer and 18-Inch Drop: Modified Proctor Applicable Method |
| ASTM D2922 | Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) |
| CONNDOT | State of Connecticut Department of Transportation Standard Specification for Roads, Bridges and Incidental Construction (Form 818) |

- B. All Applicable Local and State codes and regulations.

1.4 SUBMITTALS

- A. Submit the following in accordance with Division 1 Specification Sections.
 - 1. Name, address, and telephone number of Supplier for each type of fill material to be used on the project and source (location) of material.

2. Samples: Submit 50 lb. sample of each type of fill material in air-tight containers to Engineer to be tested by others. Contractor shall notify Engineer 24 hours prior to sampling. Contractor shall perform sampling in the presence of the Engineer or his authorized representative.

1.5 QUALITY ASSURANCE

- A. Conform to all applicable referenced standards.
- B. Observations: Workmanship and materials furnished under this Specification will be subject to observation by the Engineer. Damaged material and materials not conforming to the Specification or Drawings may be rejected at any time. Remove rejected materials and replace without expense to the Owner. Notify the Engineer in advance of starting work in order that observations may be made.
- C. Tests:
 1. General: The Owner shall pay for the cost of testing. Cooperate with testing agency to maintain a complete record of samples taken, giving source (location) of each sample.
 2. Results: If the test results indicate the material does not meet the Specifications, the Owner or his representative may require additional tests or new samples from the same source or new sources of material provided by the Contractor.
 3. Additional testing: If additional testing is required as a result of samples originally tested not meeting specifications, or additional testing is required when material is obtained from more than one source, the cost for additional testing shall be paid for by the Contractor (see Division 1 specifications).

PART 2 - PRODUCTS

2.1 OFF-SITE SELECT FILL MATERIALS

- A. Crushed Stone: Crushed stone material shall consist of clean, hard, durable, crushed particles or fragments of stone or ledge rock of uniform quality reasonably free of thin or elongated pieces.
 1. The materials shall be free from ice, snow, rubbish, sods, roots and other deleterious or organic materials.
 2. Gradation shall be as specified on the Contract Drawings.
- B. Structural Fill: Structural fill shall meet the requirements as noted on the structural drawings and shall be free of ice, snow, rubbish, sod, roots and other deleterious or organic material.
 1. Structural fill shall consist of crushed gravel and be clean, hard, durable, crushed particles or fragments of stone or gravel.

- 2. Contractor shall not change source of materials or use multiple sources without approval of the Engineer.
- C. Processed Aggregate Base Gravel: Gravel shall be clean, free from ice, snow, rubbish, sods, roots and other deleterious or organic materials and shall conform to the ConnDOT Form 818 M.05.01.
- D. Road Subbase: The material shall be free from ice, snow, rubbish, sods, roots, and other deleterious or organic materials and shall conform to the ConnDOT Form 818 M.02.02.
- E. Bank Run Gravel and Granular Fill shall comply with Article M.02 of the Form 818. Use a maximum 3 in. size for fill placed within 12 in. of concrete slabs or foundations unless otherwise noted.
- F. Sand: Sand shall be clean, free from ice, snow, rubbish, sods, roots and other deleterious or organic materials and shall conform to the following gradation requirements.

| SIEVE SIZE | PERCENT PASSING BY WEIGHT |
|------------|---------------------------|
| No. 4 | 95% - 100% |
| No. 8 | 80% - 100% |
| No. 16 | 50% - 85% |
| No. 30 | 25% - 60% |
| No. 50 | 10% - 30% |
| No. 100 | 2% - 10% |

- G. Roadway Reinforcement Fabric: Filter fabric, when called for use under paved and gravel areas, shall be a woven geotextile material and shall meet the following requirements:

| Property | Test Method | Requirement |
|-------------------------|----------------|---------------|
| Grab Strength | ASTM D-4632-86 | 300 lbs. |
| Grab Elongation | ASTM D-4632-86 | 35% (max.) |
| Trapezoid Tear Strength | ASTM D-4533-85 | 120 lbs. |
| Mullen Burst Strength | ASTM D-3786-87 | 600 psi |
| Puncture Strength | ASTM D-3787-80 | 130 lbs. |
| Water Flow Rate | ASTM D-4491-85 | 25 gal/min/sf |

2.2 COMMON FILL MATERIALS

- A. Subsoil Suitable for Reuse: As specified in Section 312300.
- B. Additional common fill required shall exclude debris, concrete or other rubble, organic matter, topsoil, all soft or wet much, peat or clay, excavated ledge material and all rocks over 6 inches in largest dimension.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify stockpiled fill to be reused is approved.
- B. Verify areas to be backfilled are free of debris, snow, ice or water, and ground surfaces are not frozen.

3.2 PREPARATION

- A. Before the first layer of fill or base material is placed, the entire work area of the original ground shall be compacted to the density required to fill materials.
- B. Maintain all areas to be backfilled, stable, dry and free of water on a 24-hour basis.
- C. Prepare natural subgrade in accordance with Section 312300 – Excavation and Fill.

3.3 BACKFILLING

- A. All liquid holding structures shall be tested for leakage prior to backfilling.
- B. Do not backfill against any wall until waterproofing membrane has been approved by the Owner's Representative.
- C. Contractor is responsible for damage to walls, and utilities, resulting from earth backfilling, trapped water or other causes.
- D. Backfill areas to required contours and elevations. Use unfrozen materials.
- E. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.
- F. Protect fill area by grading to drain and providing a smooth surface which will readily shed water. Grade the surface of the areas in such a manner as to prevent ponding of surface water runoff in areas to receive compacted fill.
- G. To the extent that it is practicable, each layer of fill shall be compacted to the specified density the same day it is placed.
- H. Fill that is too wet for proper compaction shall be disced, harrowed or otherwise dried to a proper moisture content for compacting to the required density. If the fill material cannot be dried within 48 hours of placement, it shall be removed and replaced with drier fill.
- I. If fill is too dry for proper compaction, the Contractor shall apply water to the fill uniformly applied over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.

- J. Employ a placement method so not to disturb or damage work.
- K. Maintain optimum moisture content of backfill materials to attain required compaction density.
- L. Backfill against supported foundation walls unless noted otherwise.
- M. Where both sides of a wall are to be backfilled, the difference in depth of fill from one side to the other shall be no more than 8 inches.
- N. Make changes in grade gradually. Blend slopes into level areas.
- O. Remove surplus backfill materials from site and dispose of in an acceptable manner.
- P. Leave stockpile areas completely free of excess fill materials.
- Q. Contractor shall be aware of existing conditions, including existing building construction, and shall choose compaction equipment and methods accordingly. Compaction adjacent to foundation walls shall be performed with walk behind plate compactor.
- R. Fill, and placement thereof, required due to over-excavation not approved shall be paid for by the Contractor.

3.4 AGGREGATE PLACEMENT

- A. Spread coarse aggregate over prepared base to a total compacted thickness as indicated on the site plan details.
- B. Place coarse aggregate in 6 inch layers and roller compact.
- C. Level and contour surfaces to elevations and grades indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Compact placed aggregate materials to achieve compaction to 95% of its maximum dry density.
- F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- G. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.

3.5 TOLERANCES

- A. Top Surface of Backfilling: Plus or minus one inch.
- B. Aggregate Base
 - 1. Flatness: Maximum variation of 1/4 inch measured with a ten foot straight edge.
 - 2. Scheduled compacted thickness: Within 1/4 inch as shown on site plan details.

3. Variation from true elevation: Within 1/2 inch.

3.6 COMPACTION TESTING

- A. Compaction testing will be performed in accordance with ASTM D 1556, or D 2922 and the General Conditions.
- B. Compaction testing shall be performed on each lift of fill placed. Each lift shall have a minimum of 100 feet o.c. for roadway construction.
- C. If tests indicate work does not meet specified requirements, remove work and replace at no cost to Owner. Retesting of replaced material shall be at the Contractor's expense.

3.7 FIELD QUALITY CONTROL

- A. All subgrades must be observed and approved by the Engineer prior to fill placement. Sufficient time must be given to the Engineer to observe and perform any necessary tests on the subgrade.
- B. The Contractor shall provide all offsets and other construction reference points necessary to establish and maintain location and elevation of all proposed improvements as shown on the Drawings and as field approved by the Owner's Representative during construction.
- C. The Contractor, at his own expense, shall do all engineering required for establishing grades, lines, levels, dimensions and reference points for all trades; shall be responsible for maintaining bench marks and other survey marks, and shall replace as directed, any bench marks which have been disturbed or destroyed.
- D. The Contractor shall compare all grades, lines, levels and dimensions as shown on the Drawings and actual site conditions, and shall promptly report to the Owner, before commencing work, any inconsistencies he may discover.

END OF SECTION 31 23 23

SECTION 31 2500

EROSION AND SEDIMENT CONTROLS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Provide all labor, materials, necessary equipment and services to complete the work called for in this Section or as shown on the plans, including but not necessarily limited to the following:
 - 1. Slope protection and erosion control devices and measures as shown on the Drawings, around material stockpiles, and where directed by the Engineer.
 - 2. Maintenance, repair and replacement of slope protection and erosion control devices and measures as required. One employee of the General Contractor shall be assigned to inspect the erosion control measures and to maintain or repair them as necessary. Such maintenance and repair shall take precedence over other work.
 - 3. Removal of slope protection and erosion control devices and measures when no longer required.
 - 4. Construction of temporary perimeter stone swales, sediment forebays, dewatering basins, sediment basin, and outlet structures.
 - 5. Temporary seeding or vegetative cover.
 - 6. Installation of anti-tracking pad.
 - 7. Removal of collected sediment and debris.
 - 8. Restoration of disturbed areas to finish surface indicated on Drawings.
 - 9. Installation of permanent mulches.
 - 10. Conformance to erosion notes on plans and Connecticut DEP requirements.
- B. Related Work: The following sections contain requirements that may apply to this section:
 - 1. Division 31 Section 'Excavation and Fill'
 - 2. Division 32 Section 'Seeding and Lawn Establishment'

1.3 REFERENCE STANDARDS

- A. Form 818, State of Connecticut Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction,
- B. Connecticut Guidelines for Soil Erosion and Sediment Control, the Connecticut Council on Soil and Water Conservation, 2002.
- C. Connecticut Stormwater Quality Manual, 2004.
- D. Connecticut Department of Transportation Drainage Manual, 2000.

1.4 SEQUENCING/SCHEDULING

- A. Install all soil erosion and sediment control devices and measures prior to commencing construction. Install additional measures as required during construction and maintain such structures throughout construction period.

1.5 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Submit a detailed erosion and sedimentation control plan.
- C. Jute Mesh, Netting and Filter Fabric: 12" x 12" sample with manufacturing data and instruction for installation.
- D. Shredded Bark Mulch: 1 gallon showing range of size, tree material, and name and address of supplier.
- E. EROSION CONTROL PLAN.

Before the start of construction, the Contractor shall submit the following to the Owner for approval and permitting:

1. Detailed dewatering plan, depicting method(s) of dewatering excavations, as well as the site, and the removal of sediments (sedimentation basins, splash pads, silt fence, hay bales, etc.).
2. Name, address and phone number for person responsible for the installation, inspection, maintenance and repair of the erosion and sedimentation controls before, during and after construction. The person named as responsible shall be required to insure that all erosion and sedimentation controls are inspected and repaired before and immediately after a storm event.
3. Location and provisions for protection of all stock piles, waste piles and equipment storage during construction. Storage of fuel on the site is prohibited; all fuel storage, equipment maintenance or refueling operations should be done at least 200 feet from any wetland. No equipment, materials or machinery shall be cleaned or repaired on the site and storage of equipment when not in use shall be at least 100 feet from any wetland.
4. An emergency response plan for the clean up of accidental pollution of the wetlands and/or surrounding soil by oil/gas spills or the breakdown of water pollution control or erosion and sedimentation control measures.

5. Provision for quick retrieval and clean up of any machinery, equipment, debris or other material that accidentally falls into a wetland.
6. Methods and locations of refueling, servicing and storage of vehicles and machinery. Refueling and maintenance must be done at least 200 feet from any wetland. Machinery, equipment and vehicles not in continuous use must be stored at least 100 feet from any wetland and overnight storage of equipment in use must be 50 feet from any wetland.
7. Means of catching and retaining drained oil, spent oil filters or other deleterious material and methods of disposal.
8. Method and location for the storage of oil, paint and other hazardous materials. These materials should be removed from the site during non-work.
9. Schedule of construction, including trench excavation and restoration.
10. If the Contractor proposes alternate or additional methods of erosion and sedimentation control, the Contractor must submit plans, showing location of all silt fence, stone dikes or berms, temporary sedimentation/dewatering basins, pumps, etc. for each stage of construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hay Bales.

1. Hay bales shall consist of hay from acceptable grasses and legumes, free from weeds, reeds, twigs, chaff, debris, other objectionable material or excessive amounts of seeds and grain. Hay shall be free from rot or mold and the moisture content shall not exceed fifteen (15) percent by weight at the time of weighing.
2. The hay shall be securely baled with wire of adequate size to allow for possible rusting while in use and to permit rehandling when the bale is in a saturated condition.
3. Individual bales shall be of a longitudinal shape not exceeding one hundred (100) pounds when weighed.

B. Shredded Bark Mulch:

1. Air-dried, pine or hardwood bark shredded to a size ranging from 1/4 inch to 2 inches.
2. Free from rot, leaves, twigs, shavings, coarse material, debris, and any other materials injurious to plant growth.

C. Hay Mulch:

1. Obtain from acceptable grass or legume mowings, free from weeds, coarse matter or other objectionable material.

2. Free from rot or mould with moisture content of not more than 15 percent when delivered to project.

D. Sediment Control Compost Sock:

1. *Compost:* Use only mature compost that has been certified by the U.S. Composting Council’s Seal of Testing Assurance Program (www.compostingcouncil.org), and meets the following specifications:

| | |
|-----------------------|--|
| Factor | Acceptable Range |
| pH | 5.0–8.5 |
| Moisture Content | < 60% |
| Organic Matter | > 25%, dry weight |
| Particle size | 99 % passing 2-in. sieve 30 – 50% passing 3/8-in. sieve |
| Physical contaminants | < 1%, dry weight |

2. Filter sock netting: 5mm thick continuous HDPE filament, tubular knitted mesh with 3/8-in. openings. Use biodegradable plastic if filter sock will not be removed after construction. Use 12-in. diameter netting for most applications. In very high flow areas, use 18-in. diameter netting.
3. Stakes: Use 2x2-in. wooden stakes.

G. Filter Fabric shall conform to requirements of M.08.01-26 of Form 818.

H. Erosion Control Mat - Jute Mesh and Anchoring Devices: Conform to requirements of M.13.06 of Form 817. Material must be on the 2018 CTDOT Qualified Product List. North American Green Bionet C125BN or approved equal.

I. Netting: Approved material suitable for holding hay mulch in close contact with ground.

J. Mulch Binders:

1. Asphalt: Approved product manufactured for this purpose.
2. Synthetic: Approved product manufactured for this purpose.

K. Crushed stone for construction entrance and stone berms: 2 inch diameter conforming to M.02.01-2 of Form 817.

L. Temporary Seeding: Temporary seeding shall be placed if the contractor anticipates leaving exposed areas over the winter months.

M. Drainage structure inlet protection (silt sack) shall consist of filter fabric (see below), lifting straps and containment area.

1. Filter fabric for silt sack shall consist of pervious sheets of woven monofilament fabric. Filter fabric material shall meet the following requirements.

PHYSICAL REQUIREMENTS FOR SILT SACK FABRIC

| Property | Test Method | Requirement |
|-------------------------------|-----------------|--------------|
| Grab Strength | ASTM D-4632-86 | 200 lbs. |
| Grab Elongation | ASTM D-4632-86 | 24x10 |
| Trapezoid Tear Strength | ASTM D-4632-86 | 75 lbs. |
| Mullen Burst Strength | ASTM D-3786-80a | 450 psi |
| Coefficient of Permeability k | ASTM D-4491-85 | 0.14 cm/sec. |
| Ultraviolet Stability | ASTM D-4355-84 | 70% |

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall plan and execute all operations, particularly those associated with excavation and backfilling, in such a manner as to minimize the amount of excavated and exposed fill or other foreign material that is washed or otherwise carried into wetlands and waterways.
- B. The Contractor shall furnish and place hay bales, silt fencing and other materials necessary for sedimentation and erosion control for streams and wetlands.
- C. In the event the sedimentation or siltation prevention measures used by the Contractor prove to be inadequate as determined by the Engineer, the Contractor shall be required to adjust his operations to the extent necessary to prevent any such sedimentation or siltation from occurring.
- D. The Contractor shall keep streams, brooks and other water crossings clear of mud, silt, debris and other objectionable materials resulting from his construction operations.
 - 1. The Contractor shall maintain flow capacity of river and stream channels to prevent unnatural flooding due to the Contractor's operations.
- E. The Contractor shall use temporary vegetation, soil stabilization matting, and mulching to protect areas exposed during construction. He shall minimize the amount of bare earth exposed at any one time during construction, and he shall also minimize the length of time bare earth is exposed.

Excavated material to be stockpiled for reuse shall be stored away from brooks, streams and wetland areas to prevent the washing of same back into the resource area.

- F. Baled hay shall be placed to form temporary water stops, dams, diversions, dikes, berms and for other uses connected with water pollution control. Should any bales become too clogged to

be effective, they shall be removed from the site and new hay bales provided as directed by the Engineer. Bales shall be replaced as often as necessary to provide effective sediment control.

Following completion of construction activities in a particular area, bales shall be legally disposed of, by the Contractor, off-site in an environmentally sound manner.

- G. On sloping terrain, hay bales may be used to trap sediment until vegetation has become established. The details of their placement shall be as approved by the Engineer.
- H. Sediment laden water that is being pumped from the trenches or excavations shall not be pumped directly into water courses. Discharge from construction shall be free of sediment when entering a water course. Sedimentation basins of filter fabric, wire fencing and hay bales or other means acceptable to the Engineer shall be used for this purpose.
- I. Spoil resulting from the trench excavation shall be leveled or removed to permit entry of water from adjacent land surfaces without excessive erosion or harmful ponding.
- J. The silt fence shall be maintained at no additional cost to the Owner as follows: Inspect silt fences and filter barriers immediately before and after each rainfall and at least daily during prolonged rainfall. Provide any required repairs immediately. Should the fabric on a fabric silt fence decompose or become ineffective prior to the end of the expected usable life and the barrier still be necessary, replace the fabric promptly.

Remove sediment deposits after each storm event as directed by the Engineer. As a minimum, remove sediment when deposits reach approximately one-half the height of the barrier. Dispose of sediment deposits off-site, placed upland in a manner which will prevent its later erosion into the resource area, or in a manner approved by the Engineer.

Maintain the fabric silt fence until all upslope soils are permanently stabilized by vegetation.

3.2 HAY BALE CHECKS AND BARRIERS

- A. Place hay bale checks and barriers where indicated on Drawings.
- B. Excavate soil to form shallow trench, place and firmly stake bales. Wedge loose hay between bales. Backfill and compact excavated soil against hay bales.
- C. Conform to installation details indicated on Drawings.
- D. Maintenance
 - 1. Inspect checks and barriers periodically and after each storm.
 - 2. Remove accumulated sediment periodically and when directed by Engineer.
 - 3. Repair any damage immediately.
- E. Removal and clean-up
 - 1. Remove checks and barriers when no longer required or when directed by Engineer.

2. Restore disturbed areas to finish surface indicated on Drawings.

3.3 SEDIMENT CONTROL COMPOST SOCK

- A. Place compost sock where indicated on the Drawings.
 1. Locate/Mark any utilities.
 2. Check all permits.
 3. Obtain compost meeting specifications.
 4. Obtain filter sock netting.
 5. Fill filter sock netting with compost.
 6. Mark out area for filter sock; orient length of sock parallel to the slope so that the runoff enters as sheet flow.
 7. In high-flow or steep-slope areas, orient a second sock parallel to the first to dissipate flows.
 8. Lay filter sock netting out as planned.
 9. Fill filter sock with compost.
 10. Stake filter sock every 10 ft. Stakes should be driven through the center of the sock, and 1 ft into the ground.
 11. If sock netting must be joined, fit beginning of the new sock over the end of the old sock, overlapping by 1–2 ft. Fill with compost; then stake the join.
- B. Maintenance: Inspect filter socks periodically, and especially after large storm events. Ensure that the filter sock is intact, and that the area upstream has not filled with sediment. If the upstream area has filled with sediment, or if the filter sock has been overtopped, install additional filter socks further upstream. Sediment behind the sock should be removed when the depth of the sediment reaches 3.25-in. for an 8-in. sock, 4.75-in. for a 12-in. sock and 7.25-in. for an 18-in. sock. For socks with greater diameters, remove sediment behind the sock when the accumulated sediment depth reaches 40 percent of the design diameter of the sock.
- C. Removal and clean-up
 1. Remove checks and barriers when no longer required or when directed by Engineer.
 2. Restore disturbed areas to finish surface indicated on Drawings.

3.4 EROSION CONTROL MAT – JUTE MESH

- A. Place jute mesh where indicated on Drawings immediately after surface upon which it is to be placed has been finished as specified under other sections of these specifications.
- B. Conform to installation methods indicated on Drawings and described in 9.48.03 of Form 818.

C. Maintenance

1. Inspect checks and barriers periodically and after each storm.
2. Remove accumulated sediment periodically and when directed by Engineer.
3. Repair and damage immediately.

D. Removal and clean-up

1. Remove checks and barriers when no longer required or when directed by Engineer.
2. Restore disturbed areas to finish surface indicated on Drawings.

3.5 HAY MULCH

A. Spread mulch immediately following seeding operations.

B. Mulch shall be uniformly spread by hand or machine at a rate of approximately 2 tons per acre.

C. Apply mulch to obtain a uniform depth without matted spots.

D. Stabilize mulch immediately after mulch is spread with netting, asphalt or synthetic tacking material.

E. Conform to manufacturer's instructions and obtain firm, continuous contact between mulch and soil.

F. Maintenance

1. Repair and replace areas which have been damaged.

G. Removal and Clean-up

1. Remove checks and barriers when no longer required or when directed by Engineer.
2. Restore disturbed areas to finish surface indicated on Drawings.

3.6 SHREDDED BARK MULCH

A. Spread mulch immediately following finish grading and planting.

B. Apply mulch to obtain a uniform depth of 3 inches. Remove large pieces and debris.

C. Repair and replace mulch as required to protect underlying soil.

3.7 STONE BERMS AND SWALES

A. Place stone to form berms around catch basins in areas to be paved prior to placement of pavement at locations as indicated on the Drawings.

- B. Conform to dimensions indicated on the Drawings.
- C. Repair and replace stone berms as required to protect catch basins and pipes.
- D. Construct stone swales around perimeter of excavation. Swale shall maintain a positive pitch to temporary sediment basin. Swales and sediment basin shall be cleaned as required to maintain function.

3.8 CONSTRUCTION ENTRANCE

- A. Install temporary construction entrance consisting of 2 inch crushed stone placed to the depth and area indicated on the Drawings.
- B. Remove stone when no longer required. Restore subgrade and finish to grades with materials indicated on the Drawings.

3.9 FILTER FABRIC AND SILT SACKS AT CATCH BASINS

- A. Place filter fabric and/or silt sack under grate at each catch basin in areas to be paved immediately after catch basin installation at locations indicated on the Drawings.
- B. Clean and replace filter fabric and silt sacks as required to protect catch basins and pipes.

3.10 PROTECTION OF AIR RESOURCES

- A. During the progress of work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of water as necessary, so as to minimize the creation and dispersion of dust. If the Engineer decides that it is necessary to use calcium chloride for more effective dust control then the Contractor shall furnish and apply the material as directed.
- B. Calcium chloride shall be commercial grade, furnished in 100-pound, 5-ply bags, stored under weatherproof cover and stacked alternately for ventilation. Application for dust control shall be at the rate of about 1/2 pound per square yard per application, unless otherwise directed by the Engineer.
- C. Burning of rubbish and waste material on the site shall not be permitted.
- D. Construction equipment shall be equipped with properly operating emission control devices and mufflers. Equipment not utilizing said devices shall be removed immediately from the site.

3.11 HAZARDOUS MATERIAL AND WASTE CONTROL

- A. Disposal of volatile fluid wastes (such as mineral spirits, waste oil, gasoline, or paint thinner) in storm or sanitary sewer systems or into streams or waterways shall not be permitted.

In the event that any such waste is spilled onto the ground, the Contractor shall immediately notify the Engineer, promptly clean up the spillage and all contaminated soil, and dispose of the cleanings as hazardous waste material. If a spill occurs, the clean-up activities shall take precedence over normal construction activities in order that damage to the environment is minimized.

- B. Fuels, lubricants or other hazardous materials shall not be stored in any resource areas.
- C. Fuel, lubricants and other hazardous materials shall be stockpiled within an area of positive containment. The area shall have no open communication with surface water bodies or other resource areas, shall have a base of relatively impermeable material and shall have an adequate supply of materials required for spill clean up.
- D. All hazardous materials containers shall be properly marked and their contents identified. All fuel oil, lubricant, gasoline, and hydraulic fluid containers shall be fixed in place on the transport vehicle when the vehicle is in motion.
- E. The construction project shall be in compliance with all Federal, State, and local laws with respect to hazardous materials.
- F. All clean up and disposal operations shall comply with all applicable Federal, State, and local statutes, regulations and ordinances and anti-pollution laws.

3.12 NOISE ABATEMENT

- A. Construction equipment including generator and compressors shall be enclosed or equipped with mufflers, silencers or other equipment to minimize noise.
- B. The Contractor shall limit construction noise in accordance with EPA latest standard criteria.

3.13 PERMITS

- A. The Contractor shall comply with all requirements of all applicable Federal, State, and local regulations and all permits issued for the Contract.

END OF SECTION 31 25 00

SECTION 314100

EXCAVATION SUPPORT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Installation, maintenance and removal of excavation support systems including the following:
 - 1. Shoring excavation.
 - 2. Trench excavation.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to work of this Section.
- B. All related Specification Sections shall be used in conjunction with this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials shall include support members such as soldier piles, lagging, sheet piles and other bracing members such as wales, struts, shores and tieback anchors.

PART 3 - EXECUTION

3.1 EXCAVATION SUPPORT

- A. The Contractor shall be totally responsible for the means and methods of excavation and for the design and construction of the excavation support system.
- B. All excavation support systems shall be constructed so as to be able to support all vertical and lateral loads and other surcharge loads imposed on the system during construction including earth pressures, utility loads and other surcharge loads in order to provide safe and expeditious construction of the permanent structures and prevent movement and/or damage to adjacent soil, buildings, structures and utilities.
- C. The support system shall be designed to support the maximum loads that will occur during construction.
- D. The Contractor shall not perform excavations in running ground and must employ a positive means of containing material behind support walls before excavation is allowed to proceed.

- E. The Contractor shall monitor all excavations to accurately provide a means of determining movement of adjacent soil, buildings, structures and utilities.
- F. When movement or damage is observed, the Contractor shall immediately cease excavation operations and correct such deficiencies in the excavation support system that have allowed for movement or damage and repair any and all damage that has resulted.
- G. The Contractor shall be responsible for and repair any and all damage resulting from his excavations at no additional cost to the Owner and at no additional time for performance.

3.2 ADJACENT STRUCTURES

- A. Protect Adjacent Structures: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of adjacent structures.
 - 1. Strengthen or add new supports as required during progress of the work.

END OF SECTION 31-4100

SECTION 32 12 16

BITUMINOUS ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Bituminous paving for roadways and associated preparatory work.
- B. Aggregate base course.
- C. Gravel subbase.
- D. Material for Tack Coat

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to work of this Section.
- B. All related specification sections shall be used in conjunction with this section.
 - 1. Section 31 23 23; "Site Backfill"
 - 2. Section 32 17 23; "Pavement Markings"

1.3 REFERENCE STANDARDS

- A. The State of Connecticut Department of Transportation Standard Specifications for Road and Bridge Construction (FORM 818).

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Letter of compliance shall be furnished by the Contractor to the Engineer prior to the placing of material listed under this Item.
- C. Mix/batch design shall be submitted for each type of bituminous asphalt concrete to be placed.
- D. Material certificate for tack coat.

PART 2 - PRODUCTS

2.1 MATERIALS

A. SUBBASE

1. Subbase material shall conform to the requirements of Article M.02.02, CONN DOT FORM 818 for Bank Run Gravel or unless indicated otherwise on the drawings and Section 31 23 23.

B. PROCESSED AGGREGATE BASE

1. Base material shall conform to the requirements of Article M.05.01, CONN DOT FORM 818 as noted in Section 31 23 23.

C BITUMINOUS MATERIALS

1. Bituminous concrete, tack coat, joint sealer, etc. for road repairs shall conform to the requirements of Section M.04, CONN DOT FORM 818.
 - a. Surface course of pavement mixture shall be HMA S0.375 (Superpave) Level 2, as defined in ConnDOT M.04.03.
 - b. Binder course of pavement shall be HMA S0.50 (Superpave) Level 2, as defined in ConnDOT M. 04.03.

D TEMPORARY STEEL PLATES

1. Temporary steel plates for temporary trench covers shall be suitable to withstand traffic loading, including AASHTO H20 loads. Plates shall also conform to additional requirements as indicated on the traffic control plans. Steel plates shall not be left in place for more than 12 hours. All trenches must be backfilled prior to holidays, weekends and other extended suspensions of the work.

E. MATERIAL FOR TACK COAT

1. Tack coat shall be emulsified asphalt conforming to Section M.05 of Form 818.

PART 3 - EXECUTION

3.1 GENERAL

- A. Areas to receive bituminous paving shall be as shown on the Drawings or as specified herein.
- B. Pavement restoration shall be as shown on the Drawings or as specified herein.

3.2 CONSTRUCTION METHODS

- A. In areas where trenching was conducted, the Contractor shall allow a 30-day settling period to transpire before placing permanent pavement, or as determined by the Engineer.
- B. Edges of pavement removed during trenching or other excavations shall be sawcut to provide

one-foot minimum overlap of the final patch on undisturbed material.

- C. Base course shall be constructed in the areas and to the depths shown on the Drawings and in accordance with CONNDOT Specifications, except as herein modified.
1. Gravel base and processed gravel base courses shall be placed in maximum 6-inch lifts compacted to 95% maximum density, unless otherwise directed by the Engineer.
 2. Gravel shall be fine graded with a power grader or other approved equipment. Tolerance shall be within 1/2" or less.
 3. No pavement shall be placed until fine grading has been checked and reviewed by the Engineer.
- D. Bituminous wearing and base courses shall be constructed as per CONNDOT Specifications, except as herein modified.
1. Pavement shall only be placed when the underlying surface is dry, frost-free and the surface temperature is above 50°F, unless otherwise directed by the Engineer.
 2. Pavement shall only be placed during daylight hours.
 3. Material delivered to the paver shall not have a temperature lower than 265°F. The maximum temperature of the mix shall not exceed 325°F.
 4. Place Material for Tack Coat in accordance with Form 818 between all lifts of bituminous pavement, along edges where new pavement meets existing pavement and as directed by the Engineer.
 5. All catch basins shall be covered with a acceptable cover before the paver passes over the grate.
 6. Manholes and other castings shall be sprayed with kerosene or other product before the paver passes over the casting. The casting shall be clean of asphalt at the completion of the paving.
 7. Extreme care shall be used around catch basins. The Contractor shall do the necessary handwork to provide a downward slope into the grate.
 8. Compaction shall be performed by an 8-ton minimum static steel wheel roller followed by a pneumatic-tired roller.

All rollers shall be self-propelled and designed for compaction of bituminous concrete. Roller types shall include steel-wheeled, pneumatic or a combination thereof and may be capable of operating in a static or dynamic mode. Rollers that operate in a dynamic mode shall have drums that use a vibratory or oscillatory system or combination. The vibratory system achieves compaction through vertical amplitude forces. Rollers with this system shall be equipped with indicators that provide the operator with amplitude, frequency and speed settings/readouts to measure the number of impacts per foot during the compaction

process. The oscillatory system achieves compaction through horizontal shear forces. Rollers with this system shall be equipped with frequency indicators. Rollers can operate in the dynamic mode using the oscillatory system on concrete structures such as bridges and catch basins if at the lowest frequency setting.

Pneumatic tire rollers shall be self-propelled and equipped with wide-tread compaction tires capable of exerting an average contact pressure from 60 to 90 lb./in² uniformly over the surface, adjusting ballast and tire inflation pressure as required. The Contractor shall furnish evidence regarding tire size, pressure and loading to confirm that the proper contact pressure is being developed and that the loading and contact pressure are uniform for all wheels.

9. The wearing course shall be rolled until all roller marks are eliminated.

END OF SECTION 321216

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Provide all labor, materials and equipment required to perform the work called for in this section of the Specification, or as shown on the drawings, including but not necessarily limited to the following:
 - 1. Concrete Sidewalks.
 - 2. Concrete Driveway Ramps.
 - 3. Concrete Sidewalk Ramps.
 - 4. Placing Dectable Warning Strips / Tiles.
- B. Related Work: The following sections contain requirements that may apply to this section:
 - 1. Section "Excavation and Fill".
 - 2. Section "Site Preparation and Demolition".
 - 3. Section "Cast-in-Place Concrete".
 - 4. Section "Concrete Reinforcing".

1.3 SUBMITTALS

- A. Submit supplies, product test reports, and required material certification for concrete.

1.4 QUALITY ASSURANCE

- A. All work of this section shall be provided in accordance with the latest edition of State of Connecticut Department of Transportation Form 818 which is considered to be part of this specification, the same as if fully set forth herein.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Concrete: Article M.03.01, DOT Specifications. Concrete shall be 4,500 psi.
- B. Air-Entraining Portland Cement and Entraining Admixture: Article M.03.01, Form 818.
- C. Welded Steel Wire Fabric: Six inch square steel mesh shall conform to Sub article M.06.01-3, Form 818.

- D. Reinforcement: Sub article M.06.01-1, Form 818.
- E. Processed Aggregate Base: As specified under Section "Excavation and Fill" and CTDOT From 817 Article M 5.0
- F. Expansion Joint Filler: Bituminous cellular type, AASHTO M213.
- G. Detectable Warning Strip: Detectable warning strips shall be prefabricated detectable warning tile chosen from CTDOT's Qualified Products List for retrofit or cast in place applications. Material shall be cast iron.

PART 3 - EXECUTION

3.1 GENERAL

- A. The concrete installer shall hold current ACI certification for flatwork
- B. Excavation shall be made to the required depth and to a width that will permit the installation and bracing of the forms. The foundation shall be shaped and compacted to a firm, even surface conforming to the section shown on the plans. All soft and yielding material shall be removed and replaced with acceptable material.
- C. Place and compact the base in layers not to exceed 6" in depth and to dimension after compaction as shown on the drawings. Wet and roll or tamp the base after the spreading of each layer to a maximum toleration shall be 1/4" and compacted to 95% maximum density.
- D. Construct forms of metal or wood. Construct forms straight, free from warp and of sufficient strength to resist springing from the pressure of concrete. Make forms tight to prevent leaking of mortar. Clean and wet forms before placing concrete against them.
- E. Proportion, mix and place concrete in accordance with Section 03 30 00.
- F. Concrete sidewalk shall be placed utilizing a mechanically vibratory screed to ensure proper densification of the concrete.
- F. Finishing:
 - 1. Concrete shall have a smooth trowel finish by skilled concrete finishers, a medium broom finish shall then be applied to obtain a non-skid texture.
 - 2. All outside edges and joints shall be edged with an edging tool having a radius of 1/4 inch or as indicated on the Plans.
 - 3. Additional water shall not be added to the surface to aid in finishing the concrete. If finishing aid is required, it shall be similar to Eucobar.
- G. Concrete sidewalk wet cure shall commence immediately or no longer than 30 minutes after finishing and continue uninterrupted for a period of 7 days, 5 days minimum. Wet cure shall utilize a non-marking curing paper or other curing cover similar to Hydra Cure Cover S16.

Upon approval the contractor shall utilize a dissipating curing compound only if moisture curing is not feasible. Plastic sheets or other approved materials shall be placed in close contact with the finished concrete as soon as the concrete has set sufficiently to avoid damage from the placement of coverings. The protective covering shall be maintained vapor-proof in close contact with the concrete for the entire curing period. All traffic shall be excluded during the curing period. Vehicular traffic shall be excluded for such additional time as ordered.

- H. Concrete retarding materials shall be utilized when weather has an adverse effect on placement, all sidewalk placement shall take place between April 15th and October 15th unless previously requested and approved by the Owner.
- I. Acceptance: The Engineer shall review each panel after the concrete has had sufficient time to set. The Engineer shall also review concrete test results. If in the opinion of the Engineer sufficient imperfection exists, the panel will be rejected and the Contractor shall remove and repour the defective panel. The Contractor is responsible for any damage, either by construction-related activities or vandals until final acceptance.
- J. Protective Coating:
 - 1. The concrete must be at least 14 days old before application of the linseed oil mixture. The concrete shall have at least a 48-hour period without rain just prior to the application, and shall be cleaned to remove all oil, grease and loose particles which would prevent penetration. Immediately before the application, an air blast shall be directed over the concrete so as to remove all dust.
 - 2. The mixture may be sprayed, brushed, squeegeed, or rolled. If a sprayer is used, the nozzle shall be held within 18 inches of the concrete or as directed. Unless otherwise directed, the temperature of the concrete and air shall be at least 40°F at the time of application.
 - 3. Two coats of protective coating shall be applied. The first coat shall be applied to the surface at a rate to obtain maximum penetration possible, taking care to prevent the material from discoloring curbs or other parts of the work. The second coat shall be applied as a seal coat, with special attention given to the lighter appearing areas. The rate of application shall be approximately 0.025 gallons per square yard for the first coat and 0.015 gallons per square yard for the second coat. The second application shall not be made until the concrete has regained its dry appearance, and in any event not until at least 24 hours have passed.
 - 4. The linseed oil mixture is readily flammable and all due precautions shall be observed.
- K. Backfill sides of work with suitable material thoroughly compacted and finished flush with the tops of the sidewalks. Remove and dispose of all surplus material.
- L. The Contractor will be responsible for all concrete sidewalks, driveway aprons and ramps until accepted by the Owners Representative.

3.2 CONCRETE SIDEWALKS, DRIVEWAY APRONS AND RAMPS

- A. All work shall be in conformance with Form 818, Section 9.21.03.

- B. The foundation shall be thoroughly moistened immediately prior to the placing of the concrete.
- C. Steel mesh reinforcement, shall be placed as shown on the plans, using the methods described in CONNDOT Specifications. Wire mesh shall be 6" x 6", W2.9 x W2.9 W.W.M. Wire mesh shall have a minimum twelveinch overlap. Wire mesh shall be placed on chairs spaced no more than eighteen inches on center.
- D. The concrete sidewalks shall be placed in alternate panels as shown on the plans except as otherwise directed by the Engineer.
- E. Joints:
 - 1. Trowel joints shall be of the dimensions specified. The sidewalk shall be divided into sections, as directed, by trowel joints formed by a jointing tool or other acceptable means as directed.
 - 2. Construction joints shall be formed around all appurtenances such as manholes and utility poles, curbs extending into and through the sidewalk and as indicated on the Plan. Pre-formed expansion joint filler of the thickness indicated shall be installed between concrete sidewalks and any fixed structure such as a building or curbs. This expansion joint material shall extend for the full depth of the walk.
 - 3. Contraction joints shall be placed parallel to length of walk. Joint spacing shall be as shown on the Contract Drawings. Jointing pattern shall not allow for joints at radius that create a "zero" edge.
 - 4. Expansion joints shall utilize a full depth asphalt saturated cellulosic fiber strip.
 - 5. Steel diamond shape load plates shall be utilized at all expansion joints in lieu of round dowels with the exception of areas where sidewalk ties into existing walks. Load plates, dowels and expansion joints shall be utilized at all locations where concrete is poured up against stationary objects.
 - 6. Contraction Joints shall be $\frac{1}{4}$ of the overall depth of the concrete pour to ensure contraction of the material takes place at these locations.

3.3 DETECTABLE WARNING STRIP

- A. The detectable warning strip for new construction shall be set directly in concrete and each strip shall be weighed down to prevent the strip from floating after placement in wet concrete in accordance with curing procedures. Install detectable warning strip, according to the plans and the manufacturer's specifications, or as directed by the Engineer.
- B. The detectable warning strip for retrofit construction shall be installed according to the plans in the direction of pedestrian route and contained wholly within painted crosswalk when present. Its installation shall meet all manufacturer's requirements.

3.4 TESTING

- A. The concrete shall be tested according to ASTM and ACI standards. Tests shall be performed by an independent licensed material testing laboratory. Test shall include the following:

1. Entrained air (6% \pm 1.5%).
2. Slump (4" maximum \pm 1")
3. Concrete strength (4,500 psi)
 - a. Four cylinders shall be taken each concrete pour.
 - b. Breaks shall be performed at 7 days, 28 days, 56 days. One cylinder shall be kept for future breaks as necessary.

END OF SECTION 32 13 13

SECTION 32 8400

IRRIGATION SYSTEM

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and applicable parts of Division 01 and 02 as part of this Section.
- B. Coordinate work of this Section with other underground utilities and with trades responsible for their installation. Refer to respective Drawings pertaining to other work.

1.02 WORK TO BE DONE

- A. Work to be done includes furnishing all labor, materials, equipment and services required to complete all irrigation work indicated on the Drawings, as specified herein, or both.
- B. The mechanical point of connection for the irrigation system shall be a new 10-inch connection from the booster pump.
- C. The electrical point of connection for the irrigation system shall be to an existing 120-volt, 20-amp building electrical circuit.
- D. The Drawings and Specifications must be interpreted and are intended to complement each other. The Contractor shall furnish and install all parts, which may be required by the Drawings and omitted by the Specifications, or vice versa, just as though required by both. Should there appear to be discrepancies or question of intent, the Contractor shall refer the matter to the Owner's Representative for decision, and his interpretation shall be final, conclusive and binding.
- E. All necessary changes to the Drawings to avoid any obstacles shall be made by the Contractor with the approval of the Owner's Representative.
- F. Trench excavation, back filling and bedding materials, together with the testing of the completed installation shall be included in this work.
- G. The work shall be constructed and finished in every respect in a good, workmanlike and substantial manner, to the full intent and meaning of the Drawings and Specifications. All parts necessary for the proper and complete execution of the work, whether the same may have been specifically mentioned or not, or indicated on the Drawings, shall be done or furnished in a manner corresponding with the rest of the work as if the same were specifically herein described.

H. Record Drawing as well as Operating & Maintenance Manual generation, in accordance to these specifications shall also be included in this work.

1. The Contractor shall provide the Owner with as-built drawings indicating sizes and locations of all the irrigation components as installed. The final as-built drawing shall have all new irrigation components plotted via GPS as provided by the Contractor.

1.03 SCOPE

A. A general description of the work, which is further clarified in the Specifications, to be done under this Contract includes, but is not limited to:

1. Furnish and install all new HDPE mainline and lateral piping, isolation valves, fittings, and any other necessary pipe line appurtenances for the irrigation system, including connection to the pump station and any necessary road, stream or bridge crossings.
2. Furnish and install new sprinklers and quick coupler valves with swing joint assemblies and all necessary fittings, valve boxes, etc.
3. Furnish and install a new control system consisting of central computer, interfaces, 2-wire modules, radio equipment, concrete pads, proper grounding materials, and all necessary electrical supplies.
4. Furnish and install all electrical wiring and splices including communication cables.
5. Provide one winterization and spring start-up of the irrigation system after the entire installation has been completed and approved by the Owner.

1.04 RELATED WORK

A. Carefully examine all the Contract Documents for requirements that affect the Work of this Section including but not limited to:

1. Existing Conditions: Division 02.
2. Earthwork: Division 31.

1.05 ORDINANCES

A. The Work under this Section shall comply with all ordinances and regulations of authorities having jurisdiction.

1.06 EXAMINATION OF CONDITIONS

- A. The Contractor shall fully inform himself of existing conditions on the site before submitting his bid, and shall be fully responsible for carrying out all work required to fully and properly executing the work of the Contract, regardless of the conditions encountered in the actual Work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the GENERAL CONDITIONS.

1.07 QUALITY ASSURANCE

- A. Installer: A firm, which has at least five (5) years experience in work of the type and size required by this Section and which is acceptable to the Owner's Representative.
- B. References: The Contractor must supply three references for work of this type (Golf Course) and size with their bid including names and phone numbers of contact person(s).
- C. Applicable requirements of accepted Standards and Codes shall apply to the Work of this Section and shall be so labeled or listed:
 - 1. American Society for Testing & Materials (ASTM)
 - 2. National Plumbing Code (NPC)
 - 3. National Electric Code (NEC)
 - 4. National Sanitary Foundation (NSF)
 - 5. American Society of Agricultural Engineers (ASAE)
 - 6. Underwriters Laboratories, Inc. (UL)
 - 7. Occupational Safety and Health Association (OSHA)

1.08 TESTS

- A. Observation: The Owner's Representative will be on site at various times to insure the system is being installed according to the Specifications and Drawings.
- B. Pressure Test: The entire system shall be tested at the normal system working pressure and upon visual inspection of the ground, should any leaks be found, they should be promptly repaired. The line shall then be retested until satisfactory.
 - 1. All irrigation lines shall be tested at a maximum system pressure for a period of at least 24 hours before final approval by the Owner has been given.
- C. Coverage Test: After completion of the system, test the operation of entire system and adjust sprinklers as directed by the Owner's Representative. Demonstrate to the Owner's

Representative that all irrigated areas are being adequately covered. Furnish and install materials required to correct inadequacies of coverage due to deviations from the Drawings or where the system has been willfully installed when it is obviously inadequate or inappropriate without bringing it to the attention of the Owner. (See Part 3 - Execution).

- D. The Owner's Representative shall be notified 7 days in advance for observations.
- E. During final observation, the contractor shall be responsible for having two-way communication and sufficient personnel to provide instantaneous communication between the irrigated area and the controller for the system.

1.09 SHOP DRAWINGS

- A. The Contractor shall provide copies of product specification sheets on all proposed equipment to be installed to the Owner's Representative for approval prior to the start of work, in accordance with the parameters of Division-1. Work on the irrigation system may not commence until product sheets are submitted and approved. Submittals shall be marked up to show proper nozzles, sizes, flows, etc. Equipment to be included:
 - 1. Each type of sprinkler
 - 2. Quick coupler valves
 - 3. Central control system components
 - 4. Radio equipment
 - 5. Mainline and lateral piping
 - 6. Mainline and lateral fittings
 - 7. Swing joint assemblies
 - 8. Mainline and lateral isolation valves
 - 9. Valve boxes
 - 10. Communication wiring and splices
- B. Project Record Documents:
 - 1. After completion of the entire installation, the Contractor shall furnish the as-built drawing showing all piping, wiring, sprinkler heads, valves, controllers, drains, etc., to scale with dimensions where required. All splices on 120/240-volt power, communication, and 24 volt common and control wiring shall be located on as-built plan with precise and detailed measurements indicated.

2. The Contractor should take note that approval of progress payments are predicated on the submission of updated field notes to the Owner and/or Designer. Updated measurements and field note sketches must be submitted with all applications for progress payments. The Contractor shall keep Record Drawings on site and current on a weekly basis and always available to the Designer and Owner.
3. Make neat and legible notations on this record set of drawings daily as the work proceeds, showing the work as actually installed. For example, should a piece of equipment be installed in a location that does not match the plan, indicate that equipment in a graphic manner in the location of installation and so as to match the original symbols as indicated in the irrigation legend. Should the equipment be different from that specified, indicate with a new graphic symbol both on the drawings and the irrigation legend. The relocated equipment dimensions and northing and easting coordinates should then be transferred to the appropriate drawing in this record set of drawings at the proper time.
4. On or before the date of final field observation, deliver corrected and completed AutoCAD computer plots of "record drawings" on vellum and AutoCAD electronic files on disk to Owner's Representative as part of contract closeout. Delivery of plots will not relieve Contractor of the responsibility of furnishing required information that may have been omitted from the prints.
5. All points shall be recorded by use of a GPS device.

1.10 MAINTAIN THE EXISTING SYSTEM

- A. Components of the existing irrigation system must be maintained and integrated as long as they are needed to irrigate portions of the golf course. The Owner shall make such determination of need.

1.11 DELIVERY, STORAGE AND HANDLING

- A. Store and handle all materials in compliance with manufacturer instructions and recommendations. Protect from all possible damage. Minimize on-site storage.

1.12 GUARANTEE

- A. The Contractor shall obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law.
- B. In addition to the manufacturers guarantees the Contractor shall warrant the irrigation system, both parts and labor for a period of one (1) year from the date of acceptance by the Owner.

1. All sprinkler heads shall have a five (5) year, 100 percent manufacturer's warranty against defects in workmanship from date of installation.
 2. Central and field satellite controllers shall have a one (1) year, 100 percent manufacturer's warranty from date of installation. Other materials supplied by the Contractor shall be warranted per Distributor and Manufacturer's policies.
- C. As part of the one-year warranty the Contractor shall perform the first year-end winterization and spring start-up for the irrigation system.
- D. Should any problems develop within the warranty period because of inferior or faulty materials or workmanship, they shall be corrected to the satisfaction of the Owner's Representative at no additional expense to the Owner.
- E. A written warranty showing date of completion and period of warranty shall be supplied upon completion of the project.

1.13 COORDINATION

- A. The Contractor shall at all times coordinate his work closely with the Owner's Representative to avoid misunderstandings and to efficiently bring the project to completion. The Owner's Representative shall be notified as to the start of work, progression and completion, as well as any changes to the drawings before the change is made. The Contractor shall also coordinate his work with that of his sub-contractors.
- B. The Contractor shall be held responsible for and shall pay for all damage to other work caused by his work, workmen or sub-contractors. Repairing of such damage shall be done by the Contractor who installed the work, as directed by the Owner's Representative.

1.14 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. Contractor shall include in their Bid an allowance two (2) hours of instruction of Owner and/or Owner's personnel upon completion of check/test/start-up/adjust operations by a competent operator (The Owner's Representative office shall be notified at least one (1) week in advance of check/test/start-up/adjust operations).
- B. Upon completion of work and prior to application for acceptance and final payment, a minimum of three (3) three ring, hard cover binders titled MAINTENANCE AND OPERATING INSTRUCTIONS FOR THE IRRIGATION SYSTEM, shall be submitted to the Owner's Representative office. After review and approval, the copies will be forwarded to the Owner. Included in the Maintenance and Operating binders shall be:
1. Table of Contents
 2. Written description of Irrigation System.

3. System drawings:
 - a. One (1) copy of the original irrigation plan;
 - b. One (1) copy of the Record Drawing;
 - c. One (1) reproducible of the Record Drawing;
 - d. One (1) copy of the controller valve system wiring diagram
4. Listing of Manufacturers.
5. Manufacturers' data where multiple model, type and size listings are included; clearly and conspicuously indicating those that are pertinent to this installation.
 - a. "APPROVED" submittals of all irrigation equipment;
 - b. Operation: controller operating manual.
 - c. Maintenance: including complete troubleshooting charts.
 - d. Parts list.
 - e. Names, addresses and telephone numbers of recommended repair and service companies. A copy of the suggested "System Operating Schedule" which shall call out the controller program required (zone run time in minutes per day and days per week) in order to provide the desired amount of water to each area under "no-rain" conditions.
6. Winterization and spring start-up procedures.
7. Guarantee data.

1.15 PROCEDURE

- A. Provide and install temporary support, adequate protection and maintenance of all structures, drains, sewers, and other obstructions encountered. Where grade or alignment is obstructed, the obstruction shall be permanently supported, relocated, removed or reconstructed as directed by the Owner's Representative.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the system. All material

overages at the completion of the installation are the property of the Contractor and shall be removed from the site.

- B. The manufacturer of certain materials chosen for the design of the irrigation system have been specifically referred to so as to enable the Owner to establish the level of quality and performance required by the system design. Since the golf course maintenance is managed in conjunctions with the City of Hartford's other course, Keney Park, the sprinklers and control system have be specified to maintain uniformity.
- C. The materials required for the project shall be purchased from a single authorized local distributor to ensure prompt local support for any warranty issues that may arise during construction or after completion.
- D. No material substitutions from the irrigation products described in these specifications and shown on the drawings shall be made without prior approval and acceptance from the Owner's Representative.

2.02 IRRIGATION PIPE

- A. All pipes shall bear the following markings: Manufacturer's name, nominal pipe size, schedule or class, pressure rating in psi, and date of extrusion.
- B. All piping shall be HDPE DR13.5 manufactured from PE 4710 resin as listed with the Plastic Pipe Institute as TR4. The pipe shall contain no recycled compounds except those generated in the manufacturer's own plant from the same specification resin from the same raw material. The resin shall meet specifications of ASTM D3350-50 with cell classification of PE 345464C. The HDPE pipe shall conform to the dimensions and tolerances established be ASTM Standard F714 and shall be fusion welded.

- C. Supply only pipes and fittings that are marked by the manufacturer with the appropriate ASTM designations and pressure ratings and are free from cracks, wrinkles, blisters, dents or other damage.

2.03 FITTINGS

- A. All main line and lateral directional fittings shall be manufactured of HDPE 3408/4710, SDR11, 160 psi rated (IPS sized). All HDPE fittings shall be molded if offered from the manufacturer. Fabricated fittings only allowed if a molded fitting is not an option for the particular connection or directional change. Fabricated fittings are to be manufactured using a data logger. Reference to the data logger quality control records should be referenced from an indented stamp in each fusion bead of each fitting. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be a part of the quality control records.

2.04 SWING JOINT ASSEMBLIES

- A. All 1 1/2" swing joint assemblies for sprinkler heads shall be pre-assembled units manufactured of PVC material. The swing joint assembly shall be a standard unitized model and consist of a 12" long lay length nipple.
- B. 1" swing joint assemblies for quick coupler valves shall be pre-assembled units manufactured of PVC and brass materials. The swing joint assembly shall consist of two 90-degree elbows, one 18" long riser with a 90-degree bend at one end, and a brass MPT nipple for connection to the valve. Quick coupler swing joints shall incorporate a quick coupler "lock" and stabilizer attachment.
- C. All connections shall consist of Buttress Threads and double "O" Rings providing leak free 360-degree adjustment. Wall construction shall be Schedule 80+ with special emphasis at inside corners on change of direction fittings.
- D. Swing joint assemblies shall be made from virgin PVC Type 1, Cell Classification 12454 B material listed for potable water conveyance by NFS. Working pressure shall be 200 psi combined static and surge.
- E. All PVC swing joints shall be factory assembled as manufactured by Toro.

2.05 WIRE CONDUIT

- A. Conduit for wiring beneath non-soil areas shall be PVC, SCH-40 conduit with solvent-weld joints, as manufactured by Certainteed, Cresline, JMM or equal.
- B. Sweep ells shall be standard electrical type PVC schedule 40 long sweep elbows. Cap sweep ell with tri-plug with the ring for securing nylon pull rope.
- C. Conduit for above ground wiring to shall be galvanized, rigid metallic conduit.
- D. Conduit within building shall be EMT, zinc coated. See 26 0000, 2.01A for complete specification.

2.06 SPRINKLERS

- A. All sprinklers models with required nozzle sizes shall be as indicated and spaced on the design and any detail drawings.
- B. The sprinklers to be used for the proposed irrigation system are as follows:

| Model No. | Type | Body Size | Spacing |
|-------------------|------------------------|-----------|---------|
| Toro INF55-556-66 | Part/Full Circle V-I-H | 1.5" | 75' |

| | | | |
|---------------------|------------------------|------|-----|
| Toro INF55-546-66 | Part/Full Circle V-I-H | 1.5" | 70' |
| Toro INF55-536-66 | Part/Full Circle V-I-H | 1.5" | 65' |
| Toro INF55-526-66 P | art/Full Circle V-I-H | 1.5" | 60' |

- C. The Valve-In-Head (V-I-H) sprinklers shall be a gear-driven rotary type and have a 1.5" ACME female-threaded inlet, as indicated.
- D. Part/Full circle shall be accomplished by a water-lubricated planetary gear drive and provide 3-minute, full circle rotation speeds throughout the pressure range. The sprinkler shall be adjustable by the use of an adjustment band located between the nozzle base and riser. The left terminus of the arc shall be fixed, with the right position adjustable from 40° minimum arc up to 360° maximum arc. When the 360° arc adjustment position is reached, the sprinkler will rotate uni-directionally in the clockwise direction. The sprinkler shall be adjustable during operation and when the unit is not in operation by hand; requiring no tools. The arc adjustment band shall identify the 90°, 180°, 270° and 360° arc positions. The sprinkler shall include a nozzle base clutch feature that enables the user to rotate the nozzle base in either direction (wet or dry) and hold it in one position (during operation) for spot watering.
- E. The Pilot Valve assembly shall incorporate one of five electrical activation types to control the ON-OFF operation of the sprinkler. It shall provide four pressure-point selections (50, 65, 80 and 100 psi) with a vandal-resistant locking feature that ensures the desired setting is maintained. The pressure points shall be graphically illustrated in psi. The pilot valve assembly shall include a pressure-regulation feature that continuously monitors the operating pressure inside the sprinkler body, making the necessary adjustments to ensure the desired and set regulation pressure is maintained. The pilot valve assembly shall incorporate a manual control feature that is accessible from the top and allows the sprinkler to be manually selected "ON", "OFF" or placed in the "AUTO" position, awaiting commands from the control device. The manual selector shall be red in color for enhanced visibility.
- F. Water distribution shall be via three nozzles and elevate 3-1/4" above the body when in operation. All of the sprinkler nozzles shall be of a thread-in type and color-coded for easy identification of radius and gallonage performance capabilities. The sprinkler shall be capable of accepting a fourth and fifth nozzle that can be installed inline or opposite the main nozzle to provide additional coverage. The main nozzle on the full circle models shall incorporate a selectable adjustment that provides main nozzle discharge angle adjustment at 15° and 25°.
- G. The main nozzle shall incorporate a trajectory adjustment that provides a main nozzle discharge angle from 7° to 30° in 1° increments. Trajectory adjustment shall be capable while the sprinkler is in operation or not. The sprinkler shall identify the trajectory adjustment setting from the top of the sprinkler. Close-in watering distribution shall be achieved by an inner nozzle capable of adjusting the distribution profile to optimize uniformity.

- H. The Integrated LSM Module activation type incorporates the 2-wire module and includes a DC latching solenoid for activation of the control valve. The DC latching solenoid shall be activated by the Integrated LSM module with a momentary low-voltage pulse that moves the plunger from the “OFF” position to the “ON” position where it is maintained by a permanent magnet in the solenoid. To deactivate, a second momentary low-volt pulse is applied to move the plunger from the “ON” to the “OFF” position.
- I. The internal valve assembly shall be a piston type that vents to atmosphere, providing valve friction loss of less than 5.0 psi. The sprinkler shall be designed to provide smooth valve closure in excess of two seconds to minimize damage resulting from surges and water hammer. All valve seals shall be constructed of natural rubber. The valve seat seal shall be constructed of fabric-reinforced natural rubber. The body shall incorporate an indestructible, molded-in stainless steel valve seat capable of withstanding debris contamination with no permanent damage. The valve seat shall never require servicing.
- J. The cap and nozzle base shall incorporate a pull-up feature that provides improved serviceability of the nozzles and riser assembly. The sprinkler shall have two plastic filter screens: a top-serviceable coarse rock screen in the body inlet; sized to prevent entry of larger foreign material from entering the body, and a finer screen threaded into the riser, sized to prevent foreign material from clogging the nozzle. All internal components shall be serviceable from the top of the sprinkler without disturbing the body installation. The riser and internal valve assemblies shall each be retained by a single snap ring. Sprinkler flush rate shall not exceed 5.0 GPM.
- K. The sprinkler’s body shall consist of a SMART ACCESS™ cover, removable from the top to provide access to the compartment below and all components installed within. The cover shall house a removable marker that can be laser-etched or engraved and painted to identify customer-defined information. The cover shall be attached to the compartment with three stainless-steel screws. The compartment shall provide a protective enclosure to house the pilot valve, solenoid, check ball assembly, integrated 2-wire module (if equipped), and wire splices, and provide space for future enhancements. All internal components shall be accessible from the top of the sprinkler without digging. The compartment shall provide a wire/cable entry through the bottom of the compartment, with a cable access plug to minimize the entry of debris. The compartment shall be attached to the body with two stainless-steel screws. The sprinkler body shall have a continuous molded-in stainless-steel tube connecting the control valve to the pilot valve with no internal or external plastic tubing or plastic tubing retainers. The Check Ball Housing assembly shall provide the ability to remove the pilot valve assembly without turning the water off. The check ball assembly contains a natural rubber check ball that is biased to the check position with a stainless-steel spring. With the pilot valve removed, the check ball prevents the metered water from the control valve from escaping and keeps the control valve “OFF”. It shall be installed into the compartment connected to the metered water from the control valve and provides a receptacle that accepts the connector from the pilot valve. The Pilot Valve assembly shall be hand-removable and insert-able from the top of the sprinkler with water pressure “ON”.

- L. All sprinklers shall be developed and manufactured by an ISO 9001-certified facility and shall be manufactured by The Toro Company, Irrigation Division.

2.07 QUICK COUPLER VALVES

- A. the quick coupler valve shall be one-piece type using a single slot keyway. The valve body and coupler key shall be made of cast red brass and capable of handling pressures up to 150 psi.
- B. the valve shall have a corrosion resistant stainless steel spring and self-flushing brass plunger. There shall be a chevron-shaped wiper seal to reduce leakage around the key when inserted. It shall also incorporate a drain hole in the body to minimize debris collection
- C. The quick coupler valve shall accept a Toro model 464-01 quick coupler key with a top connection of 3/4" female pipe thread and 1" male pipe thread.
- D. The quick coupler valve shall be model number 474-00 as manufactured by The Toro Company.

2.08 CENTRAL CONTROL SYSTEM

- A. The central controller shall utilize a personal-computer-based, Microsoft Windows 10 Enterprise platform, user-friendly irrigation management and control program. The central controller shall utilize a client/server architecture. Computer shall include two video outputs and allow map graphic to be floated onto secondary monitor. The central controller shall utilize site graphics with 64-bit software, including site graphics at the station level. The software shall be presented in a "flat" display, where all of the information needed is available to the user for a given operation, without having to open and close additional windows.
- B. The central controller shall have programs based on a hierarchy organized the same as the golf course. Course(s), Areas (greens, tees, fairways, etc.) followed by holes (1 through 48), followed by the individual sprinklers. The central controller shall have the ability to view the system at any of the four levels (course, area, hole, sprinkler) by Dynamic Drill down (simply clicking on a plus/minus box) to give the user intuitive control. A graphic red "Water Drop" will identify areas and holes that have stations turned off. A graphic green "Water Drop" will identify areas, holes and stations set to run automatically. A graphic blue "Water Drop" will identify areas not scheduled to water.
- C. The central controller shall allow the user to schedule areas to irrigate by either entering runtimes in minutes, or by entering amount of water to apply. If the amount is utilized, the corresponding minutes will automatically be calculated and displayed. If minutes are utilized, the corresponding amount of application shall be calculated and displayed. Runtimes shall be calculated and executed to the second.
- D. The central controller shall have a "Course Report" to allow the user to determine the status of each sprinkler station on the golf course. The Course Report shall auto generate after each night's watering to allow confirmation of all sprinkler runtimes at a glance. The Course Report

will display all Automatic and Manual Irrigation as well as stations that are currently running or on Hold. Stations that have not operated as scheduled shall be identified with a graphic red "Water Drop". The Course Report / Alert Panel shall display feedback from the Smart Hub(s) to indicate station status. The Course Report will utilize the Area, Hole, Station layout with Dynamic Drill down to quickly navigate to exceptions.

- E. The central controller shall support the creation of a customized site map displaying multiple layers. The central controller shall allow the user to quickly create a map from any digital image (jpeg, bmp or tiff format). The control system will allow the user to edit the locations of sprinklers, Turf Guard Sensors, and switches on the map. The central controller shall provide system status at the station level and display changes in status. The central controller shall be capable of creating user-defined work orders. If a scaled CAD map is utilized, or if the user adjusts the display scale of the imported image, the central controller will display area and distance measurements.
- F. The central controller shall be capable of graphically displaying projected flow on the map at the station level and displaying station activation utilizing a color-coding system that shows how stations will activate during the next 24 hours. The central controller shall be capable of creating irrigation programs through the map and making station level percentage adjustments. When programming or manually running stations, the map shall be capable of automatically zooming into the stations, holes, and areas selected.
- G. The central controller shall have the ability to communicate with and control 1 to 9 Smart Hubs, each with 2 Station Groups, each Station Group with up to 800 stations, for up to 14,400 stations.
- H. The central controller shall permit true random access of all stations in the system and allow Instant Programs to be constructed with any combination of stations regardless of wiring sequences or satellite designation. Standard Instant Programs will execute using a best-fit logic of flow management. Sequential Instant Programs will allow the user to dictate the operation order of stations.
- I. The central controller shall have the ability to manually adjust (percentage increase/decrease) by course, area, hole, station, and/or the entire system. System adjustment factors may be input via actual percentage or operational ET. The central controller shall have the ability to connect to a weather station. The weather station will measure and store temperature, relative humidity, dew point, wind speed and direction, and solar radiation for use in the calculation of evapo-transpiration. The central shall have the ability to automatically calculate and adjust watering times based on evapo-transpiration. The central controller shall also have the ability to reduce the automatically calculated runtime by the rainfall measured over the preceding 24 hours. Further, the central controller shall have the ability to adjust calculated runtimes after they have been scheduled utilizing a Rain Re-Flow alarm response.
- J. The central controller shall include the Turf Guard Soil Sensor software. Individual sensor data can be assigned to specific sprinklers to allow the user to view current soil moisture on the

Watering Plan, allowing the user to choose to skip watering if moisture levels are above user-defined thresholds, or to activate stations if moisture levels are below defined thresholds.

- K. The central controller shall employ advanced hydraulic/electrical systems management, allowing the user to specify hydraulic system design (sources and pipes representing mainlines, branches and flow groups) and the hydraulic limits of each entity. The central controller shall manage system flow by automatically generating the appropriate station start times based on the program priority and hydraulic limits set for each source and pipe, and for the simultaneous station limit set for each wire path. The central controller shall incorporate the ability to use Precipitation Management Groups to specific which stations are allowed to operate simultaneously when hydraulic capacity is available. The central controller shall show the actual location of sprinklers assigned to hydraulic links on the map allowing the user to confirm proper assignment.
- L. The central controller shall display projected flow by source, course, area, program and hole using colors to differentiate. The graph will calculate and display the maximum instantaneous flow as well as the total volume. Maximum flow and volume will be displayed in user-selected units. When pump integration is configured, the actual flow reported by the pump station can be displayed simultaneously with the projected flow for up to the last 7 days.
- M. The central controller shall have the ability to manually start programs for an entire area or for an individual hole/area. Manual programs may be started in normal program time or a manually selected time. The central controller shall have the ability to start a multi-manual cycle on a wire path, running up to 100 stations simultaneously with a run time of up to 99 minutes.
- N. The central controller shall have the ability to independently suspend (hold) the automatic operation of an individual station, a course or the entire system. The station hold duration shall be programmable for the current irrigation day up to 30 days, or may be permanent.
- O. The central controller shall have the ability to control non-irrigation devices through switch outputs. Each switch (up to 50) will have an independent seven-day calendar schedule and start times for up to 24 starts. Switch outputs may run from one minute to 23 hours and 59 minutes (programmable in one-minute increments), with individual start times for each station (switch output). Switches may also be scheduled to run with any program and include the ability to offset the start time prior to or after the start of the program.
- P. The central controller shall allow a user-defined response to a weather station or pump station based alarm. The alarm response shall have up to 99 responses for local and globalized control.
- Q. The central controller shall provide system status information on communication with the Smart Hub(s) automatically and continuously without requiring alarm configuration.
- R. The central controller shall provide reports detailing the following information: 1) projected schedule activity, 2) contents of the database constructed while programming the central

controller, 3) overview of scheduled irrigation activity including start time, end time and area information, flow and program,4) stations that are assigned to more than one program.

- S. The system shall include a personal computer, which has been certified by the manufacturer for use with the central control system.
- T. The system shall come with five-year dedicated support program provided by the manufacturer, which includes extended warranties, 24-hour component replacement, toll-free help-line support and remote diagnostics, by a licensed irrigator. The system shall include NSN Connect for secure remote access to allow the user to operate the Lynx system from any computer connected to the internet. This will also allow NSN to do remote diagnostics and support of the central controller. The system shall include Lynx Mobile, a service, which will allow the user to remotely control Lynx 24/7/365 from any web, enabled mobile device. This service will provide for manual irrigation, communication diagnostics, viewing of course status and alerts.
- U. The central controller shall be developed, manufactured, qualified and released in the USA by an ISO 9001-certified facility. The central controller, model number LX-01-5-08, shall be manufactured by The Toro Company, Irrigation Division, Riverside, California, USA

2.09 HAND-HELD REMOTE SYSTEM

- A. The hand-held radio shall be a radio-operated system that integrates with all Toro computerized central irrigation control systems and field satellites to provide communication to and from the field, or from a remote location.
- B. The hand-held radio unit shall provide clear audio verification of system commands. The hand-held radio unit shall be capable of the following start and syringe commands: Manual Multi-manual Pause and resume Cancel and hold
- C. The unit shall provide system and program pause and resume as well as system On and Off command activation.
- D. The Network Hand-Held radio shall be UL listed and CSA certified. The unit shall provide password protection for secure access
- E. The remote system shall include two (2) ICOMM hand-held radios with keypads.
- F. The hand-held radio unit shall be developed, manufactured, qualified and released in the USA by an ISO 9001-certified facility. The hand-held radio unit, model number RIU-01, shall be manufactured by The Toro Company.

2.10 ISOLATION VALVES

- A. Mainline isolation gate valves shall be a non-rising stem valve conforming to specifications of the American Water Works Association Resilient Seated gate valve Standard C-509, UL listed to FM approved for working pressures of 200 PSI. All internal parts shall be accessed without

removing the body from line. The wedge shall be of cast iron completely encapsulated with resilient material. The resilient material shall be permanently bonded to the cast iron wedge with a rubber-tearing bond to meet ASTM D 429. NRS stems shall be cast bronze with internal collars in compliance with A.W.W.A. The NRS stuffing box shall have two o-ring seals above the thrust collar. These rings shall be field replaceable without removing the valve from service. The body and bonnet shall be coated interior and exterior with fusion bonded thermosetting plastic. Cast iron isolation gate valves shall be manufactured by CLOW.

- B. The lateral isolation and drain valves shall be ball valve type constructed from High Density Polyethylene PE 4710 Full Port and manufactured in accordance with AWWA C901. Valve should maintain a bubble tight seal throughout the entire pressure and temperature range, provide blowout proof stem, and Seal design. Operation must be 360 degree open to close. Valves shall be temperature rated -20°F – 140°F. Valves shall be equipped with a 2" square operating nut and be manufactured in a facility that is ISO 9001 certified.

2.11 AIR/VACUUM VALVES

- A. The air and vacuum control valves shall be a dual acting continuous valve installed at the high points in the system or at points selected by the superintendent. The valves will permit discharging of the surge of air from an empty line when filling and relieve the vacuum when draining the system. The valves shall also release an accumulation of air when the system is under pressure.
- B. The valve shall have a 2" male NPT connection with a working pressure of 225 psi. The valve shall release 590 CFM volume of air without closing and have a sealing pressure of 3 psi.
- C. The air release valves shall be a model ARV-2-KA as manufactured by The Toro Company, Riverside, CA.

2.12 VALVE BOXES

- A. Valve boxes shall be constructed of HDPE (high-Density Polyethylene) with heavy-duty wall sections and have a tensile strength of 2700-4400 PSI. Boxes shall have T-lip lid design with secure snap fit and have the ability to be locked with a 3/8" hex head standard bolt with washer.
- B. The rectangular valve box shall be either "standard" having a 12" x 17" opening x 12" deep or "jumbo" having a 15" x 21" opening x 12" deep. The boxes shall allow for reverse stack for deeper installations or utilize extension boxes in 6" increments.
- C. The round valve box shall have either a 10" opening x 10" deep, 7" opening x 9" deep, or 6" opening x 9" deep, as called for in the details.
- D. Standard configuration shall have a black box with green lid with options for green lid and box, gray lid and box (electric), tan lid and box, purple lid and box (effluent) black lid and box, or brown lid with black box.

- E. The valve boxes shall be manufactured by The Toro Company.

2.13 COMMUNICATION WIRE

- A. Central communication cable to 2-wire modules shall be 14 AWG, solid copper, 2-conductor, suitable for direct burial for operation up to 600 volts and temperatures up to 60°C. Inner conductors shall have polyvinyl chloride insulation (black and red). The overall jacket shall be high-density polyethylene available with different color jackets.
- B. The communication cable shall include dual ripcords between the inner conductors and the outer jacket.
- C. Cable shall be model P7072D.

2.14 WIRE SPLICES

- A. Wire splicing kits for single wire connections shall be made with 3M Scotchcast connector sealing packs, part number 3570G-N. The material must be supplied in a two-part plastic composite bag with a barrier separating the epoxy from the polyol. The barrier must be capable of being broken to permit mixing the two parts without opening the bag.

2.15 CRUSHED STONE

- A. Crushed stone shall be as specified in SECTION: EARTHWORK. Crushed stone shall be used under valve boxes.

2.16 SAND

- A. Sand used for backfilling of trenches; under, around and over PVC lines shall be as specified in SECTION: EARTHWORK.

2.19 SPARE PARTS

- A. Contractor shall supply the following tools and equipment to the Owner's Representative before final observation:
 - (8) Complete Sprinklers
 - (2) 2-Wire Modules
 - (6) Quick Coupler Keys
 - (6) Quick Coupler Hose Swivels
 - (2) Mainline Gate Valve Keys, 2" Square Nut

- (2) Complete Sets of Sprinkler Tools
- (10) V-I-H Flag Keys Before final observation can occur, written evidence that the Owner's Representative has received the tools and equipment must be shown to the Owner.

PART 3 EXECUTION

3.01 GENERAL

- A. Before work is commenced, hold a conference with the Owner's Representative to discuss general details of the work.
- B. Examine all contract documents applying to this Section noting any discrepancies and bringing the same to the attention of the Owner's Representative for timely resolution.
- C. All work indicated on Drawings shall be provided whether or not specifically mentioned in the Specifications.
- D. If there are ambiguities between Drawings and Specifications, and specific interpretation or clarification is not issued prior to bidding, the interpretation or clarification will be made only by Owner's Representative, and Contractor shall comply with the decisions. In the event the installation contradicts the directions given, the installation shall be corrected by Contractor at no additional cost to Owner.
- E. Verify dimensions and grades at job site before work is commenced. Do not proceed with installation of the landscape irrigation system when it is apparent that obstructions or grade differences exist or if conflicts in construction details. Legend or specific notes are discovered. All such obstructions, conflicts, or discrepancies shall be brought to the attention of the Owner's Representative.
- F. Make all field measurements necessary for the work noting the relationship of the irrigation work to the other trades. Coordinate with other trades (landscaping and other site work trades). Project shall be laid out essentially as indicated on the Irrigation Plans, making minor adjustments for variations in the planting arrangement. Major changes shall be reviewed with the Owner's Representative prior to proceeding.
- G. Layout of the piping indicated on Drawings is diagrammatic only. Location of sprinkler equipment is contingent upon and subject to integration with all other underground utilities. Contractor shall employ all data contained in the Contract Documents and shall verify this information at the construction site to confirm the manner by which it relates to the installation.
- B. Coordinate installation of all sprinkler materials, including pipe, to avoid conflict with the trees driplines.
- C. During progress of work, a competent superintendent and all assistants necessary shall be on site. All shall be satisfactory to the Owner's Representative. The superintendent shall not be

changed, except with the consent of the Owner's Representative, unless that person proves unsatisfactory and ceases to be employed. The superintendent shall represent the Contractor in his absence and all directions given to the superintendent shall be as binding as if given to the Contractor.

- D. At all times, protect existing roads, landscaping, paving, structures, walls, footings, etc. from damage. Any inadvertent damage to the work of another trade shall be reported at once.
- E. Replace, or repair to the satisfaction of the Owner, all existing paving disturbed during course of work. New paving shall be the same type, strength, texture, finish, and be equal in every way to damaged paving.
- F. The word "piping" in these specifications means pipe, fittings, nipples, and valves, and shall be considered as such in this installation.
- G. The arrangements, positions, and connection of piping, drains, valves, and the like indicated on the plan, shall be followed as closely as possible, but the right is reserved by the Owner to change locations and elevations to accommodate conditions which may arise during the progress of the work prior to installation without additional compensation for such changes. The responsibility for accurately laying out the work and coordinating the installation with other trades rests with the Contractor. Should it be found that any work is laid out so that interference will occur, the Contractor shall report that to the Owner before commencing work.
- H. The existing irrigation system is to remain operational during the installation of the new system.
The Contractor shall be responsible for repairs to the existing system caused by his operations until the Owner indicates the existing system is no longer needed.

3.02 REVIEW AND REPORT ON THE EXISTING SYSTEM

- A. Prior to starting any work, the GC shall provide a complete report of the existing irrigation system. This report will make the owner aware of any deficiencies in the system including not but limited to controllers, valves, lines, power, pulse wiring and sprinklers. The GC shall review the entire system with the golf course superintendent, all deficiencies shall be marked up on a plan with supporting documentation, photos, etc. The GC shall submit the report for approval prior to beginning any work.

3.03 STAKING

- A. The Contractor, Designer and Owner are to stake out all proposed pipe and wire routes, sprinklers, valves and controller locations in accordance with locations shown on the plan. All staking will be done prior to commencement of work in any area of the installation. The Contractor shall furnish all supplies, equipment, and personnel necessary for the staking of the work.

- B. The Contractor shall give a minimum of three (3) days notice to the Owner of the day he wishes to stake a particular section of the work and shall be responsible for arranging the staking with the Designer.

3.04 EXCAVATION & PIPE INSTALLATION

- A. The Contractor shall do all excavating, vibratory plowing, backfilling and compaction required for the proper installation of the work according to standard acceptable industry practices.
- B. Pipe routing shall be in accordance with the plan, however, the Owner shall have the right to change the route and/or depth of the pipe where rock or other obstacles may interfere with the intended path. Piping for greens shall be kept to the outside fringe areas if possible. All lateral piping and valves shall be located on the side or back of greens and tees.
- C. The Contractor, with approval of the Owner, also may adjust the location of any pipeline and/or depth to avoid large rock or other obstacles, provided that the adjustment does not affect the performance of the system. In no event shall such changes affect the cost of the work except where those changes greatly alter the quantity of materials and/or labor.
- D. All trenches shall have the sod removed by the Contractor, excavated and properly backfilled with sod replaced. The Contractor shall have the option to reuse the sod, if not reusable, or replace with new sod supplied at the Contractor's expense. New sod shall be approved by the Owner before installation. The minimum trench width shall provide for a minimum space of 4" on each side of the piping. Trench widths shall be held close to these minimums to avoid excess earth loads on piping.
- E. Mainline piping shall have a minimum cover of 24". Trenches shall be backfilled with rock-free soil completely surrounding the pipe. Any trenches that are in extremely rock-filled soil, or if ledge is present, shall require the trench to be back-filled with a minimum of 4" of sand surrounding the pipe. The Owner shall supply all sand required for backfilling.
- F. Lateral piping shall have a minimum cover of 16". The use of a vibratory plow for pipe installation shall only be allowed as long as minimum cover is maintained and there is no evidence of damage to the pipe.
- G. If soil conditions do not permit the Contractor to install piping at specified depths, the Contractor and Owner shall agree to alternate methods of installing the piping. Shallower depths, different piping material, backfill type, etc. may be explored to overcome installation obstacles.
- H. The Contractor must provide effective protection at all times to prevent sand, rubbish, or any other debris from entering the piping. When work is stopped at night, or at any other time, the ends of the piping must be closed and properly secured. Sidewalks, cart paths and driveways shall be clear of project debris and equipment at all times and barricades and/or tape shall be installed around any trenches left open.

- I. The Contractor shall provide any necessary pumps for removing water from trenches and other parts of the work to prevent trenches and/or slopes from caving in.
- J. When backfilling, all backfill material shall be free from rock, large stone or other unsuitable substances to prevent damage to piping and wiring. Backfilling of trenches containing plastic pipe shall be done when the pipe is cool to avoid excessive contraction in cold weather. All backfill material will be compacted in 6" layers as it is brought up to finish grade to insure that no settling results. Excess trench material shall be removed to a readily accessible on-site location as designated by the Owner, at the Contractor's expense.
- K. The Contractor shall be responsible for repairing all depressions or damage cause by their equipment as determined by the Owner.
- L. Pipe shall be installed strictly in accordance with recommendations of the manufacturer.
- M. Loam or topsoil encountered within the limits of trench excavation for irrigation mains and branch lines shall be carefully removed to the lines and depths as shown on the Drawings and stockpiled for subsequent replacement in the upper 6 inches of the trench from which it is excavated. Such removal and replacement of the quantities of loam shall be considered incidental to the irrigation system.

3.05 ROAD AND WALK CROSSINGS

- A. Any cutting or breaking of sidewalks, cart paths, and/or roads shall be performed by the Contractor with necessary re-paving as part of the Contract cost. Permission to cut or break sidewalks, cart paths, and/or roads shall be obtained from the Owner. Hydraulic driving or drilling under asphalt or concrete paving must be approved by the Owner.
- B. All piping under roads shall be installed in piping sleeves double the nominal pipe size. All wires under roads shall be installed in electrical conduit or HDPE pipe sized for the number of wires that are required to pass through.

3.06 STREAM / BRIDGE CROSSINGS

- A. All crossings through streams and/or wetland areas that require the pipe to be attached under a bridge, shall be done with High Density Poly Ethylene (HDPE) pipe. HDPE pipe shall be DR11 or DR13.5 and be the same nominal size of the mainline pipe, unless marked otherwise.
- B. Any elbows required to bring HDPE bridge crossing back to standard main line trench depth shall be made with butt fused molded HDPE fittings before connection to PVC pipe. No PVC pipe shall be left exposed above ground.

3.07 ROCK EXCAVATION

- A. If rock is encountered in the alignment and depth shown on the plan, the alignment and/or depth shall be adjusted in order to avoid excavation if possible. If alignment and/or depth adjustment

cannot be made and it becomes necessary to remove the same, the Contractor shall be paid for all the additional cost incurred in the handling of rock per submitted BID UNIT PRICE.

- B. Deleterious material shall be removed and hauled to an accessible on-site dumping location, determined by the Owner. Determination of deleterious material shall be made jointly by Owner and Contractor.
- C. The Owner shall supply replacement backfill material to a central storage area at the Owner's expense. Contractor shall put such replacement backfill material in place at his expense.

3.08 TRENCH SETTLEMENT

- A. During the work period, it shall be the Contractor's responsibility to refill any trenches that may have settled due to incomplete compaction.
- B. If within one year from completion date, major settlement due to improper compaction occurs, and an adjustment in pipe, sprinkler heads, topsoil and seed, or paving is necessary to bring the system to the proper level of the permanent grade, the Contractor, as part of the work under this Contract, shall make said adjustments without extra cost to the Owner. It will not be the Contractor's responsibility to re-compact trenches that have been eroded by natural heavy rainfall.

3.09 ELECTRICAL & WIRE INSTALLATION

- A. The Contractor will be responsible to have connections made to the building electrical system as is required for the proper operation of the automatic control system. Sub-contracting for an electrician to perform any wiring required by local code, shall be the Contractor's responsibility.
- B. Wire shall be installed in the same trenches as piping wherever possible and laid on the side of the pipe. All wires shall be bundled or tied together every 8 to 10 feet with electrical tape or tie straps. Wire shall be installed with a minimum slack of 18 inches at all 90-degree bends and at all solenoid connections. 120/240 VAC UF power wire shall maintain a minimum of 24" of cover at all times.
- C. All control circuitry passing through the wall of a building or beneath a road or cart path shall be installed in a suitable electrical conduit.
- D. The jointing of all underground wires shall be by the use of wire nuts covered with Scotchlock waterproof connections per installation instructions provided by the manufacturer. Under no circumstances shall wire connections, outside of the satellite controller, be made without the use of a waterproof connector
- E. Any splices on the communication wiring shall be installed in a 10" round valve box with a grey cover. All splices shall be precisely measured and marked on the as-built drawing.

3.10 VALVE BOX INSTALLATION

- A. Valve boxes shall be installed with adequate space for operation and service of equipment in the box. A minimum of 4" of pea stone or gravel shall be placed under each box for both drainage and leveling of the box. Gravel shall be furnished by the Contractor.
- B. All valve boxes shall be mounted flush to grade. Extensions shall be used as required for proper installation and setting.
- C. Valve boxes shall be installed so that position of box will allow full open and full close of shut-off valves.

3.11 4.11 GROUNDING

- A. Central controller, antenna and interfaces shall be properly grounded by use of a ground rod, copper grounding plates and ground enhancement material (GEM). Ground wires, ground rods and ground plates shall be installed in separate trenches, not in trenches with other wires.
- B. Ground rods shall have a minimum diameter of 5/8" and a minimum length of 8'. These are to be driven into the ground in a vertical position or an oblique angle not to exceed 45 degrees. Ground rods are to be stamped as UL listed.
- C. The copper grounding plate assemblies shall meet the minimum requirements of Section 250 of the National Electric Code. They shall be made of copper alloy intended for grounding applications and will have minimum dimensions of 4"x96"x0.0625". A 25-foot continuous length (no splices allowed) of #6 AWG insulated solid copper wire is to be attached to the plate using an approved welding process. The ground plate is to be installed to a minimum depth of 30". Two 50-pound bags of PowerSet earth contact material shall be spread so that it surrounds the copper plate evenly along its length. The use of salts, fertilizers and other chemicals are not to be used to improve soil conductivity.
- D. All ground circuit connections are to be made using an approved exothermic welding process. Solder shall not be allowed to make connections.
- E. The Contractor shall take grounding readings during dry conditions, to determine the resistance to ground for each controller. The resistance to ground readings shall be incorporated in the maintenance manuals. "As Built" drawings shall indicate the ground wire paths, ground rods and ground plates, including measurements. If the installation of the grounding equipment described above does not result in meeting the minimum resistance required, after determination by the designer, the Contractor may be asked to install grounding as specified. The additional grounding equipment shall be installed at the unit price submitted in the Bid Form for this item.

3.12 SPRINKLER AND VALVE INSTALLATION

- A. Sprinklers shall be connected to piping by installation of pre-assembled PVC swing joint assemblies. The swing joint assemblies shall be factory pre-assembled and installed so that the assembly and sprinkler are not directly over the piping or service tee.

- B. If backfill material contains rocks or stones, or is comprised of heavy clay, all swing joint assemblies and sprinklers attached shall be completely backfilled with sand to within 3" of final grade. Sand will be supplied by the Owner.
- C. Quick coupling valves shall be installed on pre-assembles PVC swing joint assemblies.

3.13 AIR RELEASE VALVE INSTALLATION

- A. Air release valves shall be installed as indicated on the plan, or as otherwise directed by the Owner, at the highest points of the main line piping system

3.14 REMOVAL OF EXISTING SYSTEM

- A. The Contractor shall remove components of the existing system once they are no longer needed, as deemed by the Owner. Components to be removed include existing sprinklers, quick coupler valves, electric valve assemblies, valve boxes, satellite controllers and pads, etc.
- B. The Contractor shall remove sprinklers, quick couplers and swing joints down to the existing piping and properly cap pipe to remain under pressure.
- C. All holes shall be filled with loam and seeded or resodded, as provided by the Owner. Contractor shall bring removed equipment to a specific site as directed by the Owner. The Owner will be responsible for disposal of all stockpiled equipment.

3.14 CHECK/TEST/START-UP/ADJUST

B. Testing:

1. Prior to pressurizing the system, the GC is responsible to confirm that the pressure at the point of connection(s) from the existing to the proposed system matches the previous system (city water pressure vs pond pump). The GC is responsible to report any deviations to the owner's representative and make modifications as needed.

Leakage test: test all lines for leaks under operating pressure. Repair all leaks and re-test.

2. Coverage test: perform a coverage test in the presence of the Owner's Representative (notify Owner's Representative at least seven (7) days in advance of scheduled coverage test). Representative will determine if the water coverage is complete and adequate. Readjust heads and/or head locations as necessary or directed to achieve proper coverage.
3. All testing shall be at the expense of the Contractor.

3.15 CLEANING AND ADJUSTING

- A. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by the operation of the system for testing.
- B. Adjust sprinkler heads, valve boxes, and quick coupling valves to grade as required, so that they will not be damaged by mowing operations.
- C. Continue sprinkler coverage adjustment as required by settlement, etc., throughout the guarantee period.
- D. Each control zone shall be operated for a minimum of 5 minutes and all heads checked for consistency of delivering water. Adjustments shall be made to sprinklers that are not consistent to the point that they match the manufacturer's standards. All sprinklers, valves, timing devices or other mechanical or electrical components, which fail to meet these standards, shall be rejected, replaced and tested until they meet the manufacturer's standards.
- E. The Contractor is required to adjust timing devices of the existing and proposed control systems as needed to not run concurrently.

3.16 ACCEPTANCE AND OPERATION BY OWNER

- A. Upon completion of the work and acceptance by the Owner, the Contractor shall be responsible for the training of the Owner's Representative(s) in the operation of the system (provide minimum 7 days written notice in advance of test). The Contractor shall furnish, in addition to spare parts, record drawings and operational manuals, copies of all available specification sheets and catalog sheets to the Owner's personnel responsible for the operation of the irrigation system.
- B. Conditions for acceptability of work for start of maintenance by Owner issued by Owner or Owner's Representative shall include but not be limited to:
 - 1. Punch list items complete and approved by Owner or Owner's Representative.
 - 2. Landscape irrigation system complete and in place.
 - 3. Record drawings complete.
 - 1. Maintain installation and watering schedules until all conditions noted above have been completed.

3.17 CLEAN UP

- A. Upon completion of all installation work, Contractor shall remove all leftover materials and equipment from the site in a safe and legal manner.

- B. Contractor shall remove all debris resulting from work of this section.
- C. Contractor shall re-grade, lightly compact, and replant around sprinkler heads where necessary to maintain proper vertical positioning in relation to established grade.
- D. Contractor shall fill all depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas in accord with Drawings requirements.

END OF SECTION

SECTION 32 9119
PLANTING SOIL AND FINE GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all work and related items as indicated on the Contract Documents and as specified in this Section and includes, but is not limited to, the following:

1. Furnishing, testing, placing, spreading, amending and grading of planting soil.

B. Related Sections

1. Section 31 25 00 - Erosion and Sedimentation Controls
2. Section 31 23 00 Excavation and Fill
3. Section 32 92 19 Seeding and Lawn Establishment

1.2 QUALITY ASSURANCE

- A. Qualification of Landscape Contractor: The work of this Section shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years' experience. Proof of this experience shall be submitted per SUBMITTALS paragraph of this Section.

1.3 SUBMITTALS

- A. Submit proof of landscape contractor's experience to the Engineer in accordance with QUALITY ASSURANCE paragraph of this Section.

1. Experience: The Contractor shall submit two copies of the proof of experience for the Landscape Contracting firm for this project to the Engineer for review and approval.

- B. Testing shall be at the Contractor's expense. Collect samples per the requirements of the testing laboratory. Contractor shall deliver all samples to testing laboratories via overnight courier and shall have the testing report sent directly to the Engineer. Perform all tests for gradation, organic content, soil chemistry and pH by UMASS Soil and Plant Tissue Laboratory, West Experiment Station, North Pleasant Street, Engineer of Massachusetts, Amherst, MA 01003, (413) 545-2311 or approved equal.

1. Loam analysis shall include:

- a. soil pH by water pH and buffer (smp) pH tests, percentage organic content, nitrate nitrogen, ammonium nitrogen, phosphorus, potassium, calcium, aluminum, magnesium, manganese, Micronutrients, Toxins including but not limited to lead, cadmium, arsenic and mercury, Saturated hydraulic conductivity per ASTM D5856, Calculated CEC

- b. Soil analysis tests shall show recommendations for new lawns for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish the work as specified.
 - c. Test results: test data and recommendations for soil amendments including but not limited to: nitrogen, phosphorus, potassium and limestone.
- C. Limestone: Submit supplier's certification that the limestone being supplied conforms to these Specifications
- D. Fertilizer: Submit product data of seeding fertilizer and certificates showing composition and analysis. Submit fertilization rates for fertilizer product based upon soil testing, analysis, and recommendations as specified, performed and paid for under in this Section.
- E. Compost: The Contractor shall submit two 10-lb samples of compost to be used in backfill mix accompanied by certified laboratory test results per the requirements of this special provision.
- F. Planting Soil Installation Procedures: Contractor shall submit written program containing but not limited to the following:
 - 1. Schedules of work
 - 2. Description of the equipment that will be used for transport, compaction and installation of Planting Soil on the Project site
 - 3. Cleanup
 - 4. Removal of environmental protections
 - 5. Acceptance of the program does not relieve the Contractor from the responsibility to conduct the work in strict accordance with the requirements of Federal, State and local regulations, standards and laws, the Project specifications, or to adequately protect the health and safety of all workers involved in the Project, any members of the public who may be affected by the Project, and the surrounding environmental resources.

1.4 EXAMINATION OF CONDITIONS

- A. All areas to be improved shall be inspected by the Contractor before starting work and any defects such as incorrect compaction, grading or drainage problems shall be reported to the Engineer prior to beginning this work. The commencement of work by the Contractor shall indicate acceptance of the areas to be improved, and assumption of full responsibility for the work of this Section.
- B. The Contractor shall be solely responsible for judging the full extent of work requirements involved.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Loam

1. Existing on site soil shall not be allowed for use as planting soil.
2. Loam shall be "fine sandy loam" or "sandy loam" determined by mechanical analysis (ASTM D-422) and based on the "USDA Classification System". Loam shall have the following mechanical analysis:

| <u>Textural Class</u> | <u>% of Total Weight</u> | <u>Avg%</u> |
|--------------------------------------|--------------------------|-------------|
| Sand (0.05 - 2.0 mm dia. range) | 50 - 70 | 60 |
| Silt (0.002-0.05 mm dia. range) | 25 - 35 | 30 |
| Clay (less than 0.002 mm dia. range) | 5 - 15 | 10 |

3. Loam shall contain not less than 3.5 percent nor more than 4.5 percent organic matter as determined by the loss on ignition of oven-dried samples.
4. Loam shall be free of debris and other extraneous matter. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 millimhos/cm. (Test minus sieve #10 material). Soils shall not have levels of extractable aluminum greater than 200 parts per million.
5. No loam shall be delivered to the site until the review and approval of loam test results by the Engineer.
6. Loam shall be altered per the testing recommendations to support seed germination and turf establishment. Amend as required to ensure the following:
 - a. The loam shall have an acidity range of 6.2 pH to 6.8 pH.
 - b. Macro and Micro nutrients levels recommended per the test report.

B. Manufactured Compost

1. Manufactured Compost shall be mature, stable, weed free, and produced by aerobic decomposition of organic matter. Compost feedstock may include, but is not limited to: agricultural, food or industrial residuals; class A biosolids as defined in the EPA CFR Title 40, Part 503; yard trimmings, or source-separated municipal solid waste. The product must not contain any visible refuse or other physical contaminants, substances toxic to plants, or over 5% sand, silt, clay or rock material by dry weight. The product shall possess no objectionable odors.
2. Manufactured Compost must meet all applicable USEPA CFR, Title 40, Part 503 Standards for Class A biosolids. The moisture level shall be such that no visible water or dust is produced when handling the material.
3. In addition, Manufactured Compost shall have the following properties:
 - a. pH: 5.5 – 7.5

- b. Organic matter (% dry weight basis): 30 – 65
- c. Soil salt (electrical conductivity): maximum 5 dS/m (mmhos/cm)
- d. Moisture content %, wet weight basis: 30 – 60
- e. Particle size, dry weight basis: 98% pass through 3/4 inch screen or smear
- f. Stability carbon dioxide evolution rate: mg CO₂-C/ g OM/ day < 2
- g. Solvita maturity test: > 6
- h. Physical contaminants (inerts), %, dry weight basis: <1%
- i. Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels
- j. Biological contaminants select pathogens fecal coliform bacteria, or salmonella, meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) level requirements

C. Soil Additives

- 1. General: Soil additives shall be used to counteract soil deficiencies as recommended by the soils analysis and as supplements for Planting Soil construction as specified herein.
- 2. Ground limestone for adjustment of Planting Soil pH shall contain not less than 85 percent of total carbonates and shall be ground to such fineness that 40 percent shall pass through 100 mesh sieve and 95 percent shall pass through a 20 mesh sieve. Contractor shall be aware of Planting Soils pH and the amount of lime needed to adjust pH to meet the requirements of the testing lab recommendations.
- 3. Commercial fertilizer shall be a product complying with the State and United States fertilizer laws. Deliver fertilizer to the site in the original unopened containers bearing the manufacturer's certificate of compliance covering analysis and which shall be furnished to the Engineer's Representative. Fertilizer shall contain not less than the percentages of weight of ingredients as recommended by the soil analysis.
 - a. One hundred percent of the nitrogen content shall be derived from organic materials. Nitrogen source shall be coated to ensure slow release. Fertilizer percentages of weight of ingredients shall be as recommended by the soil testing and analysis specified, performed, and paid for under this Section.

PART 3 - EXECUTION

3.1 FILLING AND COMPACTION

- A. Perform all earthwork in accordance with Sections 31 23 00 Excavation and Fill, of this Specification.

3.2 GENERAL

- A. Planting Soil shall be protected from erosion at all times. Materials shall be spread as soon as possible after completion of the work of rough grading and excavation and filling has been completed.
- B. Planting soil shall consist of (1) part compost to (3) parts loam evenly mixed.
- C. 'Evenly distribute and spread Planting Soil to depths required across the project site.
- D. No Planting Soil shall be handled, planted, or seeded in any way if it is in a wet or frozen condition. A moist Planting Soil is desirable

3.3 LAWN AREA / FINE GRADING

- A. Lawns areas subgrades shall be scarified to a 6" depth prior to dumping and placing planting soil.
- B. Immediately prior to dumping and spreading Planting Soil in locations shown on the Contract Documents, the subgrade shall be cleaned of all stones greater than 2 inches and all debris or rubbish. Such material shall be removed from the site, not raked to the edges and buried. Notify the Engineer that the subsoil has been cleaned and request his/her attendance on site to review and approve subgrade conditions prior to spreading Planting Soil.
- C. After Planting Soil has been spread in turf areas, spread fertilizer and limestone across the surface of the spread Planting Soil and till the Planting Soil to a depth of 6 inches to integrate fertilizer and limestone into the top layer of the Planting Soil.
- D. Remove all large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter from the Planting Soil. Remove from unscreened soils all stones over 1 inch in diameter from the top 6 inches of the Planting Soil bed.
- E. Sufficient grade stakes shall be set for checking the finished grades. Stakes must be set in the bottom of swales and at the top of slopes. Deviation from indicated elevations that are greater than one-tenth of a foot shall not be permitted. Connect contours and spot elevations with an even slope. Finish grades shall be smooth and continuous with no abrupt changes at the top or bottom of slopes.
- F. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional Planting Soil and the surface shall be re-graded and rolled until presenting a smooth and even finish corresponding to the required grades.
- G. The Contractor shall install Planting Soil in successive horizontal lifts no thicker than 6 inches in turf areas to the required compaction levels as described herein. At the edges of bituminous concrete walkway, the Contractor shall install Planting Soil at a higher level to anticipate any reduction of Planting Soil volume due to settling during the warranty period.
 - 1. Compact Planting Soil to the required density as specified herein.

2. Maximum dry density for Planting Soil shall be determined in accordance with ASTM D698. In lawn areas the following percentages of minimum to maximum dry densities shall be achieved:

| <u>Minimum</u> | <u>Maximum</u> |
|----------------|----------------|
| 83% | 86% |

3. The surface area of each lift shall be scarified by raking prior to placing the next lift.

H. In addition to the range cited above, compact each lift sufficiently to reduce settling but not enough to prevent the movement of water and feeder roots through the soil. The Planting Soil in each lift should feel firm to the foot in all areas and make only slight heel prints. At completion of the Planting Soil installation, the soil should offer a firm, even resistance when a soil sampling tube is inserted from lift to lift. In the presence of the Engineer's Representative probe installed Planting Soil with Penetrometer to verify Planting Soil compaction is no greater than existing conditions probed at the start of the Contract.

I. Select equipment and otherwise phase the installation of the Planting Soil to ensure that equipment does not travel over already installed soil. Contractor shall back his way out of the project site.

J. Disturbed areas outside the limit of lawn work shall be graded smooth and spread with a minimum of 6 inches of Planting Soil to the finished grade.

3.4 3.03 ACCEPTANCE

A. Confirm that the final grade of the Planting Soil is at the proper finish grade elevations. Adjust grade as required to meet the contours and spot elevations noted on the Plans. Request the presence of the Engineer to inspect final grade. Do not precede with the remaining work of this Contract until the Engineer has given his/her written approval of the final grade.

END OF SECTION

SECTION 32 9219

SEEDING AND LAWN ESTABLISHMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to provide a self-sustaining turf, including but not limited to seeding, establishment, maintenance and protection.

B. Related Sections

1. Section 329119 - Planting Soil and Fine Grading
2. Section 312300 - Excavation and Fill

1.2 QUALITY ASSURANCE

- A. All seeded and sodded areas shall receive an application of a pre-emergent weed killer. And erosion control mats shall not contain any poly netting. Netting shall be 100% natural.

- B. Qualification of Landscape Contractor: The work of this Section shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years' experience. Proof of this experience shall be submitted per SUBMITTALS paragraph of this Section.

C. REFERENCES

1. Turf Trials - National Turfgrass Evaluation Program (NTEP)

1.3 SUBMITTALS

- A. Submit proof of landscape contractor's experience to the Engineer in accordance with QUALITY ASSURANCE paragraph of this Section.

- B. Fertilizer, erosion control systems for steep slopes, limestone, fiber mulch used for hydroseeding, additives for amendment of soils, and other miscellaneous materials required by this Section: Submit product literature and certificates showing composition and analysis.

- C. Seed: Submit a manufacturer's Certificate of Compliance to the Specifications with each shipment of each type of seed. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.

- D. Submit program for turf establishment to the Engineer for review and consideration. Program shall include maintenance and watering schedule. Acceptance by the Engineer of the submitted

program does not reduce Contractor obligation to establish a full and healthy turf landscape in all areas.

1.4 EXAMINATION OF CONDITIONS

- A. All areas to be improved shall be inspected by the Contractor before starting work and any defects such as incorrect grading or drainage problems shall be reported to the Engineer prior to beginning this work. The commencement of work by the Contractor shall indicate acceptance of the areas to be improved, and assumption of full responsibility for the work of this Section.
- B. The Contractor shall be solely responsible for judging the full extent of work requirements involved.

PART 2 - PRODUCTS

2.1 MATERIALS

A. PLANTING SOIL

- 1. Loam shall be specified in accordance with, provided, installed and paid for under the work of Section 329119 - PLANTING SOIL AND FINE GRADING

B. SOIL ADDITIVES

- 1. Soil additives shall be specified, provided and paid under Section 329119 - PLANTING SOIL AND FINE GRADING except for additional applications of fertilizer that shall be provided and paid for under this Section 32 9219, based upon recommendations from soil analysis and testing as specified under Section 32 9119.

C. SEED

- 1. Seed mixture shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and in no case shall the weed seed content exceed 0.25% by weight. The seed shall be furnished and delivered in the proportion specified below in new, clean, sealed and properly labeled containers.
- 2. All turf type grasses shall be ranked within the top 15 percent of the referenced Turf Trials.
- 3. Turf type grasses shall be selected for the following desirable traits:
 - a. Tall fescue, Perennial ryegrass, Fine fescue cultivars/selections shall have a Turf Quality rating greater than or equal to 6.0 on average for the preceding 4 years as determined by cited turf trials. Fine fescues shall be selected so that, in aggregate, the cultivars/selections provide high turf density, quick establishment, tolerance to summer heat and humidity, and disease resistance.
- 4. Seed shall be mixed by a dealer. Contractor shall furnish the Engineer the dealer's guaranteed statement of the composition of the mixture.

5. All seed shall comply with State and Federal seed laws and shall carry 'Certified State of Origin' tags on their bags or containers at the time of seeding. Seed shall conform to applicable state seed laws and standards of minimum purity, minimum germination, maximum crop seed, maximum weed seed, and be free of noxious weed seed as specified in this Section.

a. Seed Mixture for Greens:

| <u>Common Name</u> | <u>Proportion By Weight</u> |
|------------------------------|---------------------------------|
| Barracuda Creeping Bentgrass | 33% |
| Penn A4 Creeping Bentgrass | 34% |
| 007 Creeping Bentgrass | 33% |

Seeding rate shall be 8 pounds per 1,000 square feet.

b. Seed Mixture for Tees and Fariways:

| <u>Common Name</u> | <u>Proportion By Weight</u> |
|-------------------------------|---------------------------------|
| Chewings Fescue | 60% |
| Creeping Red Fescue | 20% |
| Barracuda Creeping Bentgrass, | 10% |
| Musket Colonial Bentgrass, | 10% |

Seeding rate shall be 8 pounds per 1,000 square feet.

c. Seed Mixture for Rough:

| <u>Common Name</u> | <u>Proportion By Weight</u> |
|---------------------|---------------------------------|
| Chewings Fescue | 25% |
| Creeping Red Fescue | 15% |
| Perennial Ryegrass | 20% |
| Kentucky Bluegrass | 40% |

Seeding rate shall be 8 pounds per 1,000 square feet.

D. FERTILIZERS

1. Fertilizer shall be a commercial product complying with the State and United States fertilizer laws. Deliver to the site in the original unopened containers that shall bear the man-

manufacturer's certificate of compliance covering analysis. Fertilizer shall contain not less than the percentages of weight of ingredients as recommended by the soil analysis specified, performed and paid for under the Section 329119 - PLANTING SOIL AND FINE GRADING

E. EROSION CONTROL BLANKETS

1. Erosion control blanks shall be for short-term use with functional longevity of no less than 12 months duration.
2. Blankets shall have consistent thickness with straw evenly distributed over the entire area of the mat. Matrix of straw fiber shall be 0.5 lbs/yd².
3. The blanket shall be covered on the top and bottom sides with 100 percent biodegradable woven natural jute fiber netting. Top netting shall be 9.3 lbs/1000 ft². Bottom netting shall be 7.7 lbs/1000 ft².
4. Thread shall be degradable.
5. Erosion control blankets shall meet all requirements of the Erosion Control Technology Council Specification and the FHWA Standard Specification FP-03 Section 713.17, type 2.D Short-term Double Net Erosion Control Blanket

F. HERBICIDES, CHEMICALS AND INSECTICIDES

1. Provide chemicals and insecticides as needed for fungus or pest control.
2. Provide post emergent crab grass control throughout the maintenance period to ensure a germinated and mown lawn free of crab grass.

G. WATER

1. Contractor shall provide all water, machinery and labor required to establish turf. During the establishment and maintenance period the Contractor shall irrigate as required to insure sufficient water is applied to all seeded areas to ensure germination, growth and establishment of permanent grass species. Soluble salt levels in irrigation water shall be less than 1 mmhos/cm (ds/m).

PART 3 - EXECUTION

3.1 FILLING AND COMPACTION

- A. Filling, compaction and fine grading of planting soils shall be specified, performed and paid for under the work of Section 329119 - PLANTING SOIL AND FINE GRADING.

3.2 TURF ESTABLISHMENT – GENERAL REQUIREMENTS

- A. The following general requirements shall apply to all turf establishment:
 1. Submit program for turf establishment of all seed types to the Engineer for review and consideration. Acceptance by the Engineer of the submitted program does not reduce Contractor obligation to establish a full and healthy turf landscape in all areas.
 2. Perform all seeding, mulching and/or culti-packing operations in a manner that will prevent erosion. Soil erosion by wind, rainwater, snow melt or over irrigation resulting in

damage to or loss of seed bed, germinated cotyledons or growing turf will require restoration and re-establishment of planting soils and grasses and an extension of the maintenance and guarantee period at no addition cost to the Owner.

3. Ensure direct seed to soil contact. Under no circumstances shall seed be separated from direct contact with the planting soil. Any program element that does not include direct seed to Topsoil contact will be rejected.
4. Seed distribution shall be uniform, even and consistent in all areas. Seed application system(s) shall accommodate different seed types, shapes, weights and sizes.

3.3 SEEDING

- A. Contractor shall obtain Owner Representative's approval of fine grading and bed preparation before doing any seeding.
- B. Limit of grading and earthwork shall be limit of seeding unless otherwise indicated on the Contract Documents. All areas disturbed outside the limit of seeding shall be prepared and seeded as specified herein at no additional cost.
- C. The season for seeding shall be from April 1 to June 1 and from August 15 to September 30. The actual planting of seed shall be done, however, only during periods which are normal for such work as determined by weather conditions and by accepted practice in this locality. To prevent loss of soil via water and wind erosion and to prevent the flow of sediment, fertilizer, and pesticides onto roadways, sidewalks, and into catch basins, seed within 5 Days of spreading the planting soils.
- D. Seed only when the bed is in a friable condition, not muddy or hard.
- E. Means and methods of seeding shall be determined by the Contractor based on his/her experience, site conditions, season of seeding, weather conditions and any, all or other environmental conditions. Seeding of lawn may be by Drop Seeding Method, Hydroseeding, Drill Seeding or other method selected by the Contractor and accepted by the Landscape Architect.
- F. Application rate for seeding shall be as described in Part 2 - PRODUCTS, above.

3.4 EROSION CONTROL MATTING

- A. Erosion and sediment controls shall be in accordance with Section 31 25 00 - EROSION AND SEDIMENTATION CONTROLS
- B. Install Erosion control blankets on slopes and in drainage swales where erosion could occur and as directed by the engineer. Erosion Control shall be installed immediately after seeding operations. Install blankets in accordance with manufacturer's written instruction
- C. Blankets shall be installed perpendicular to slopes, and shall extend at least 3 feet beyond slope crest. Fibers shall be placed in contact with the soil for the entire length of the blanket. Provide check slot at top of slope and anchor slot at bottom of slope where indicated.

- D. Do not stretch the fabric. In drainage swales, center the fabric along the flow line. Install the matting in a check slot at the top and bottom of the slope of the area to be covered. Check slots shall be 6 inches deep and 6 inches wide. Fabric shall extend down one wall of the check slot and across the full width of the base. Overlap edges of matting rolls 4 inches minimum and overlap the ends 18 inches at a minimum.
- E. Install staples in check slots, edges, center and ends of rolls by driving specified steel staples 2 feet on center over the entire area to be covered, except at check slots and ends of rolls, where staples shall be placed 6 inches on center.
- F. Fill check slots with Topsoil and tamp firmly.
- G. Following blanket installation, roll the entire area with a smooth drum roller weighing between 50 and 75 pounds per linear foot of roller. The finished installation of blanket shall be firmly in contact with the soil and provide a smooth, finished appearance free from lumps or depressions.

3.06 TURF MAINTENANCE

- A. Maintenance shall begin immediately after any area is seeded and shall continue until Final Acceptance of the project. In the event that seeding operations are completed too late in the fall season for adequate germination and growth of grass, then maintenance shall continue into the following spring for the minimum 60 Day period or until Final Acceptance, whichever occurs later. Install blankets or netting to prevent loam degradation and movement over the winter. Submit product literature and samples of erosion control system to the Engineer for review and approval. Blankets and netting shall be placed in a timely manner at no additional cost to the Owner.
- B. Maintenance shall include reseeded, mowing, watering, weeding, fertilizing a minimum of two times in addition to the fertilizer incorporated by harrowing into the spread planting soil, and re-setting and straightening of protective barriers. Lawn work maintenance shall also include chemical treatments as required for fungus and/or pest control.
- C. During the maintenance period, any decline in the condition of seeded areas shall require immediate action to identify potential problems and to undertake corrective measures.
- D. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities of water over small areas, and prevent damage to the finished surface by the watering equipment.
 - 1. The Contractor shall provide all labor and manage all watering necessary to establish an acceptable lawn. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary to maintain moist soil to a depth sufficient to provide germination, growth and establishment. At no time shall a tank truck be allowed on the seeded beds.
 - 2. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply water to the Topsoil bed to ensure germination, growth and establishment until Final Acceptance.

- E. After the grass in seeded areas has germinated, reseed all areas and parts of areas that fail to show a uniform stand of grass. Reseed such areas and parts of areas repeatedly until all areas are covered with a satisfactory growth of grass. Reseeding together with necessary grading, fertilizing, and trimming shall be done at the Contractor's expense.
- F. Mowing and Edging of Turf Areas:
- G. The Contractor shall keep turf areas mowed until Acceptance of the contract by cutting to a height of 2 inches when growth reaches 3 inches or as directed by the Landscape Architect.
- H. At each mowing, all edges of walks, drives, plant beds and other border conditions shall be edge trimmed by hand or machine to produce straight and uniform edge conditions.
- I. Remove and discard from paved areas only clippings and debris generated by each mowing and edging operation legally off-site. Engineer, if practical and aesthetic, may allow sweeping (not blowing) clippings back into grass. Mowers shall be equipped with mulching blades. Do not remove from grass areas any clippings that have been generated by mowing operations. Do not mow grass when wet.
- J. Fertilizing: The first application of fertilizer is specified, purchased, performed and paid for under the 329119 - PLANTING SOIL AND FINE GRADING. A second application of fertilizer shall be quick release and shall be applied to seeded lawn, slope and buffer areas at the time of the first mowing and shall be performed and paid for under this Section 32 9219. This second application shall be applied at a rate that ensures that one-half pound of nitrogen is applied per 1,000 square feet. Phosphorus and potassium shall be applied proportionally in accordance with the recommendations of the soil tests and the quantities previously integrated into the soil during the first application. A third application of 100 percent slowly soluble or slow release nitrogen fertilizer shall be applied to seeded areas approximately two months after the second application. This third application shall correspond to the following application rates dependent upon the month of application. Fertilizer application rates shall be based upon soil testing results.
 - 1. May 1-15: Apply 1.0 pound of nitrogen per 1,000 square feet.
 - 2. June 15-30: Apply 1.0 pound of nitrogen per 1,000 square feet.
 - 3. August 15 through September 15: Apply 1.0 pound of nitrogen per 1,000 square feet.
 - 4. November 1-15: Apply 1.5 pounds of nitrogen per 1,000 square feet.
- K. Reset and replace all lawn protection fencing as required to prevent access onto lawn areas.
- L. During the maintenance period, any decline in the condition of seeded areas shall require immediate action to identify potential problems and to undertake corrective measures.
 - 1. The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn. In the absence of adequate rainfall, watering shall be performed daily to promote the germination and growth of specified grass species and varieties.
 - 2. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the fin-

ished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply water to the required soil depths each 8-hour period.

3.5 APPLYING LIMESTONE

- A. The Contractor shall return to the site at the beginning of the next seeding season and spread limestone across all lawn areas installed under this Contract. Limestone shall be spread at rates determined by the soil tests specified.

3.6 ACCEPTANCE

- A. Following the minimum required maintenance periods for lawn construction, the Contractor shall request the Engineer in writing for a formal inspection of the completed work. Request for inspection shall be received by the Engineer at least 10 Days before anticipated date of inspection.
- B. Acceptance Requirements
 - 1. At the end of the maintenance period, seeded areas shall have a close stand of grass as defined above with no weeds present and no bare spots greater than 3 inches in diameter over greater than 5 percent of the overall seeded area. At least 90 percent of the grass established shall be permanent grass species. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded areas shall be extended until deficiencies are corrected. Seeded areas to be corrected shall be prepared and reseeded in accordance with the requirements of this specification.
 - 2. At the time of acceptance, the Contractor shall remove temporary barriers used to protect lawn areas.
- C. Furnish full and complete written instructions for maintenance of the lawns to the Owner at the time of acceptance in conformance with Submittals requirements.
- D. Engineer's inspection shall determine whether maintenance shall continue in any part.

3.7 CLEAN UP

- A. Absolutely no debris may be left on the site. Excavated material shall be removed daily by the Contractor as directed. Repair any damage to site or structures to restore them to their original condition, as directed by the Landscape Architect, at no cost to the Owner.

END OF SECTION

SECTION 32 9300

PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all planting work and related items as indicated on the Contract Documents and as specified in this Section and includes, but is not limited to, the following:
 - a. Planting trees, shrubs, perennials, groundcover, bulbs and vines
 - b. Staking, guying, and anchoring trees
 - c. Planting maintenance
 - d. One-year guarantee period for all plants
 - e. Providing and placing backfill mix

B. Related Sections

1. Section 312300 - Earth Excavation and Fill

1.2 QUALITY ASSURANCE

- A. Qualification of Landscape Contractor: The work of this Section shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years' experience. Proof of this experience shall be submitted per SUBMITTALS paragraph of this Section.
- B. Foreman or Crew Leader: The project foreman or crew leader shall have at least five years experience in management, handling and installation of ornamental and native plant material for municipal or state landscape construction projects, be a Connecticut licensed Arborist and shall be on-site during all work activities required by this special provision. Proof of this experience shall be submitted per submittals.
- C. All work shall conform to Connecticut Pesticide Laws and Regulations per the Department of Agricultural Resources Pesticide Program. All applicators must have a State Pesticide License. Mixing, applying and/or disposing of herbicides shall be in accordance with instructions on the labels. All applicators must wear the required personal protective equipment specified on the label.

- D. The Landscape Contractor shall be responsible to coordinate with plant material suppliers in sufficient time to ensure that all of the plants as specified in the contract plant list are available in sufficient quantity for installation.
- E. An arborist, licensed by the State of Connecticut, is required for performing all pruning work.
- F. At least one tree and one shrub of each variety is to be tagged with a waterproof tag bearing legible designation of botanical and common names, and all other standard products shall be delivered sealed and unbroken.
- G. Do not make substitutions without written approval. If specified landscape material is not available, obtain approval for substitution from the Engineer.
- H. The Engineer reserves the right to inspect all plant materials for compliance with specifications, and to reject unsatisfactory or defective work at any time during progress of work.
- I. REFERENCES
 - 1. The following standards shall apply to the work of this Section.
 - a. Pruning Standards: ANSI A300 Part 1: Trees, Shrubs & Other Woody Plant Maintenance – Standard Practices (Pruning).
 - b. SPN: “Standardized Plant Names,” latest edition, by the American Joint Committee on Horticultural Nomenclature.
 - c. American National Standards Institute (ANSI): Z60.1 American Standard for Nursery Stock, latest edition, published by American Association of Nurserymen, (AAN)

1.3 SUBMITTALS

- A. Submit in accordance with Submittal requirements,
 - 1. Submit proof of landscape contractor's experience to the Engineer in accordance with QUALITY ASSURANCE paragraph of this Section.
 - a. Experience: The Contractor shall submit two copies of the proof of experience for the Landscape Contracting firm and the firm’s foreman or crew leader for this project to the Engineer for review and approval.
 - b. Licenses: The Contractor shall submit two copies each of the herbicide applicator’s license, the foreman or crew leader’s arborist license, and the arborist license for the individual who will be pruning plant material to the Engineer’s approval.
 - 2. Plant Material: At least 90 days prior to anticipated planting, the Contractor shall submit confirmation of availability for all plants on the plant list, accompanied by nursery sources. When the specified types and sizes of plants are not available, substitutions may be made upon written request by the Contractor. Substitutions proposed by the Contractor shall have equivalent overall form, height, and horticultural characteristics and must be approved in writing by the Engineer prior to tagging.

3. Selection of Plant Material: At least 14 work days prior to the date on which the plant selections are to be made and at least 30 days prior to the expected planting date, the Contractor shall request, in writing, that the Engineer select and tag plant material to be furnished. The letter of request shall also have attached a certification from the supplier attesting to the fact that the stock to be selected from is, in fact, the specified plants required under this Section. No substitutions will be permitted unless approved in writing by the Engineer.
4. The Contractor shall arrange for and bear the cost of transportation, meals in transit, and overnight accommodations, if necessary, for the Engineer during the period of time required to select and tag the required plant material. All trees shall be tagged at the source and in the ground prior to digging. The Contractor shall provide the necessary tags or seals for identifying the plant material. The tags shall be of durable construction and are numbered sequentially with raised lettering.
5. For all other materials outlined the Contractor shall submit to the Engineer material samples, manufactures' product data, certified test results, and (where applicable) installation instructions attesting that the following materials meet the requirements specified. No materials shall be ordered until submittals have been approved by the Engineer. Delivered materials shall match the samples.
6. These materials are as follows:
 - a. Backfill Mix: The Contractor shall submit a 10 lb. representative sample of the backfill mix according to the requirements specified herein.
 - b. Water Retention Agent: The Contractor shall submit certified laboratory test results per the requirements of this special provision.
 - c. Antidessicant: The Contractor shall submit certified laboratory test results per the requirements of this special provision.
 - d. Tree and Shrub Fertilizer: The Contractor shall submit certified laboratory test results per the requirements of this special provision.
 - e. Mulch: The Contractor shall submit one 10-lb sample of mulch accompanied by certified laboratory test results per the requirements of this special provision.
 - f. Water: The Contractor shall submit certified laboratory test results per the requirements of this special provision.
 - g. In addition, the Contractor shall submit the following:
 - h. Water: Submit a watering schedule, including sources of water, methods of irrigation, and any incidental work required to provide water for the plants as specified.
 - i. Planting Schedule: Submit to the Engineer in writing the proposed planting schedule. Obtain approval of planting schedule from the Engineer prior to performing any work.

1.4 EXAMINATION OF CONDITIONS

- A. All areas to be improved shall be inspected by the Contractor before starting work and any defects such as incorrect grading or drainage problems shall be reported to the Engineer prior to beginning this work. The commencement of work by the Contractor shall indicate acceptance of the areas to be improved, and assumption of full responsibility for the work of this Section.
- B. The Contractor shall be solely responsible for judging the full extent of work requirements involved.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect all products from weather or other damaging or deteriorating conditions.
- B. Plants which have been damaged or have deteriorated in transit or storage are not acceptable.
- C. Keep plants moist, fresh, and protected against exposure to sun, wind, and freezing temperatures whether in the receiving yard, in transit, while being handled, or at the job site awaiting planting.
- D. Deliver trees, shrubs and groundcover after preparations for planting have been completed and plant immediately

1.6 PLANTING DATES

- A. Prepare a proposed planting schedule. Schedule dates for each type of landscape work during normal seasons for such work. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays. Unless otherwise directed by the Engineer, the planting season shall be as follows:

Deciduous material: Spring - March 15 to June 15

Fall - September 1 to October 15

Evergreen material: Spring - March 15 to May 30

Fall - August 15 to November 15

- B. Requests for exceptions to this schedule shall be submitted in writing to the Engineer for approval. Planting under frozen conditions in either the spring or fall will not be permitted. Planting before or after the above referenced planting dates will increase the likelihood of plant or grass seed establishment failure. Any deviation from the above referenced planting dates is undertaken at sole risk of the contractor and it is the responsibility of the contractor to provide any additional maintenance and watering which may be required to ensure satisfactory plant establishment.

- C. Those species known to be fall digging hazards shall be dug during the spring season only. Fall planting of these species shall be permitted only with certification, from the nursery, of the time of digging and at the discretion of the Engineer.
- D. Correlate planting schedule with specified maintenance periods to provide maintenance to date of acceptance.
- E. Coordination with Lawns: Plant trees, shrubs, and groundcover after final grades are established and prior to planting of lawns, unless otherwise acceptable to Engineer. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

1.7 SPECIAL CONDITIONS

- A. Should discrepancies exist between plant quantities or plant sizes as shown in the Planting Schedule and on the Planting Plan, quantities and sizes shown on the Planting Plan shall govern. Contractor shall install all plants as shown on the plan at no additional cost to the Owner.

1.8 WARRANTY

- A. Provide a warranty for plant material for a minimum of (18) months including one continuous growing season after the completion of the Plant Establishment. Commence warranty on date identified in the Certificate of Final Completion.
- B. Warranty: Include coverage of plants from death or unhealthy conditions as determined by the Engineer.
- C. Replacements: Plants of same size and species as specified, planted as soon as possible in the next planting season, with a new warranty and a Plant Establishment commencing on date of replacement.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Loam
 - 1. Loam shall be specified in accordance with, provided, installed and paid for under the work of Section 329119 - PLANTING SOIL AND FINE GRADING
- B. Manufactured Compost
 - 1. Manufactured Compost shall be specified in accordance with, provided, installed and paid for under the work of Section 329119 - PLANTING SOIL AND FINE GRADING
- C. Water Retention Agent

1. Water Retention Agent shall be medium grade Hydrogel.
2. Water Retention Agent shall be a cross-linked potassium polyacrylamide/acrylate copolymer.

D. Antidessicant

1. Antidessicant shall be an emulsion which permits transpiration while retarding excessive loss of moisture from plants. Use "Wiltpruf" or approved equal.
2. Deliver in manufacturer's fully identified containers and mix according to manufacturer's direction.

E. Tree and Shrub Fertilizer

1. When soil tests indicate soil amendments, apply soil conditioners or fertilizers to amend soil to specified conditions as indicated in the analysis.
2. Complete fertilizer in granular form, from commercial sources bearing manufacturer's analysis; 10-10-10 ratio of N-P-K.
3. Significant quantities of trace elements such as iron, boron, etc. shall be contained in the fertilizer.
4. One hundred percent (100%) of available nitrogen shall be in a slow release form as found in certain urea form products or natural organic forms or a combination of both.

F. Staking and Guying Materials

1. Guy Web: Shall be a low abrasion woven fiber webbing with a break strength of 900 lbs. or better. The width of the webbing shall be no less than 5/8 inch, nor greater than 3/4 inch. The length shall be sufficient enough to be attached to the tree trunk and stake.
2. Stakes: Shall be on a hardwood source, free of knots, insects and fungi. Stakes shall be of uniform size and shape and shall be a minimum of 2 inches by 3 inches by 8 feet. Stakes shall be pointed with a taper of no less than 4 inches
3. The above ground stake height shall be 8 inches above the point of attachment. The type of stakes shall be uniform throughout the job.
4. Tree Staples- Tree Staple shall be a Tree Staple stabilizer as provided by Tree Staple Inc. or approved equivalent. Size and Quantity per tree shall be per manufacturer's recommendations.

G. Mulch

1. Pine Bark Mulch shall be derived from evergreen tree bark aged to a minimum of six months and no more than eighteen months. The bark shall be shredded so that the resulting pieces are no more than 1/2 inch thick and no longer than 3 inches. The mulch shall be ninety-eight percent (98%) organic matter with a pH of 3.5 to 4.5. The mulch shall be free of stringy material and shall not contain an excess of fine particles. The mulch shall be brown in color, free of leaves, twigs, sod, weeds, shavings and other foreign materials which are injurious to health plant growth.

H. Portable Drip Irrigation Bag

1. Portable Drip Irrigation Bag shall hold a minimum of 15 gallons of water with slow drip holes release system taking place over several days. Use “Treegator Original” or approved equal.

I. Water

1. Clean, fresh potable water free from injurious chemicals and other toxic substances harmful to plant life. No brackish water will be permitted.
2. The Engineer will reject any water delivered to the site which, after on-site, post-delivery testing, does not meet these specifications.

J. Plant Materials

1. The Contractor shall furnish all plants as shown on the plans, unless otherwise directed by the Engineer. All plants shall be nursery grown.
2. Plant materials shall conform in size, grade and quality to the “American Association of Nurserymen Standards for Nursery Stock.” As approved by the United States of America standards institute, in effect at the time of bidding.
3. Plants of other kinds than those named in the Plant Schedule on the Drawings shall not be accepted without written approval of the Engineer.
4. Unless otherwise approved by Engineer, all plants shall be nursery-grown in accordance with good horticultural practices and shall have been grown within hardiness Zones 4 through 6a, as established by the USDA Plant Hardiness Zone Map, will be accepted. The Contractor's suppliers must certify in writing that the stock has actually been grown under Zone 6a or hardier conditions. Plants not so certified will not be accepted.
5. All plants must be moved with the root systems in soil. Balled and burlapped plants shall be wrapped with untreated 8 ounce burlap, firmly held in place by a stout cord or wire. Wire containers of adequate size to allow root development for the plant size as per ASNS requirements. Plants prepared with plastic or other non-biodegradable wrappings will not be accepted. Rootballs shall remain intact during all operations. No plant will be accepted if the rootball has been badly cracked or broken prior to, or during, the process of planting. Rootballs shall be moist upon arrival and shall be kept moist until installation. All balled and burlapped plants that cannot be planted at once must be heeled in by setting them in the ground, covering the rootballs with soil, and watering them adequately.
6. Container-grown stock shall have been grown in the container long enough for the root system to have developed sufficiently to hold its soil together firmly. No plants shall be loose in the container. Container-grown plants shall not be pot bound, with spiraling roots or roots growing densely against the sides of the container. Score or butterfly cut rootball of all container-grown plants prior to planting.
7. Each plant shall have plenty of fibrous roots, healthy buds, and shall be free of disease or insect pests, eggs or larvae. All plant parts shall show active green cambium when cut. They shall be densely foliated when in leaf.
8. Plants shall be dug, handled and transported so as to prevent damage of any sort including but not limited to breakage of branches or limbs, scraped or bruised trunk or broken rootball. Plants shall be protected from desiccation during digging, storage and transpor-

tation by watering, covering and application of anti-desiccants as necessary to ensure their continued health and viability.

9. All plant material shall comply with the state and federal law with respect to inspection for plant disease and insect infestation.
10. Replacement plants larger in size than existing may be used if approved by the Engineer, provided use of larger plants does not increase Contract price.
11. If use of larger plants is approved, increase ball of earth of spread of roots in proportion to size of plant.

PART 3 - EXECUTION

3.1 PLANTING

- A. **Verification:** Determine the full extent of Work required, including but not limited to the potential need for storing and maintaining plants temporarily and re-handling plants prior to final installation. Inspect all areas to be planted before starting any landscape work and report any defect, such as incorrect grading, incorrect subgrade elevations, or drainage problems, etc., to the Engineer prior to beginning work. Do not proceed with installation until all unsatisfactory conditions have been corrected. Commencement of Work indicates the Contractor's acceptance of site conditions and filled subgrade material in areas to be planted, and the Contractor assumes responsibility for work.
- B. **Layout:** Determine location of underground utilities and layout plants so as to avoid possible damage to such structures. Plant pits and bed locations as shown graphically and/or verbally on plans, shall be staked on ground by contractor and approved by the Engineer prior to excavation. Notify the Engineer at a minimum of 48 hours in advance prior to scheduling any field inspections. Should discrepancies exist between plant quantities in Planting Schedule and Planting Plan, quantities shown on the Planting Plan shall govern. Adjustments in locations and outline shall be made as directed in field. Labor, equipment, and new smooth stakes are to be furnished by the Contractor for this purpose.
- C. **Excavation:** Planting beds and pits shall conform to the approved staked locations and outlines. Holes dug for plantings shall in all cases be large enough to include the complete root system of the plant (tree, shrub, and groundcover) to be received and also sufficient amounts of approved backfill around the periphery of the rootball. All sod, weeds, roots, cobbles, and stones and other objectionable materials excavated from the plant holes, which is unsuitable for backfill shall be removed from the site immediately and legally disposed of.
- D. **Plant Hole Size:** The minimum plant hole size, unless otherwise specified, shown on the plans or directed by the Engineer shall be as follows
 1. **Trees and Shrubs -** The planting hole shall be twice the diameter of the rootball in width and no deeper than 2 inches less than the distance from the bottom of the rootball to the root collar (i.e. a 12 inch tall ball will require a 10 inch deep hole). Any excavation in excess of that required shall be replaced and compacted to eighty-five percent (85%) of maximum density.

2. Groundcover - The planting hole shall be twice the diameter of the rootball in width and equal to the depth from the bottom of the rootball to the level at which it was grown in the nursery. Any excavation in excess of that required shall be replaced and compacted to eighty-five percent (85%) of maximum density.
- E. Any rocks or underground obstructions shall be removed to a depth necessary for planting as specified, unless alternate locations for the planting are approved by the Engineer. If removal of obstructions results in a deeper hole than specified for planting, backfill material shall be added and compacted to eighty-five percent (85%) of maximum density to the correct depth.
- F. Backfill Mix: Add loam and compost to existing suitable soil excavated from the planting hole to create mix for planting pits. Backfill Mix shall be at least twenty-five percent (75%) loam and twenty-five percent (25%) compost.

3.2 SETTING PLANTS

- A. Plants shall be handled in such a manner that the soil of the rootball will not be loosened from the roots. Carefully place plant into the prepared hole. Set plants plumb, place one third of the manufacture's recommended Water Retention Agent around the rootball, and fill in around the rootball to one half the depth of the hole with backfill mix. Thoroughly tamp the backfill mix to eighty-five percent (85%) of maximum density.
- B. Fill remaining area of planting hole with water. Once the water has completely drained loosen burlap and peel down at least the top two-thirds. Wire baskets to be cut off and removed. Roots that have been wrapped around the ball within the burlap shall be made to lay in as natural a manner as possible. Cut broken or frayed roots cleanly. Prune girdling roots.
- C. Fill remaining area of hole with backfill mix, place two-thirds of the manufacture's recommended Water Retention Agent around the rootball, and thoroughly tamp to eighty-five percent (85%) of maximum density. Form a saucer around the edge of through backfill hole by constructing a berm. The finish height of the compacted berm shall be 4 inches higher than the surrounding grade. No excess soil shall be allowed to remain within the plant saucer. Fill saucer with water.

3.3 PRUNING OF NEW PLANT MATERIAL

- A. After planting, prune only dead, broken or deformed branches and in such manner as to preserve natural character of plant.
- B. Perform all pruning with sharp tools, with cuts flush and clean. Do not apply paint or asphalt emulsion tree wound compound on cut area.
- C. Trees which have had their leaders cut, or so damaged that cutting is necessary, will not be accepted. There shall be no abrasion of bark, nor fresh cuts of limbs over ½ inch.

3.4 WATERING

- A. The plants shall be watered immediately following planting.
- B. Soak the plants thoroughly again within a twenty-four hour period after the initial planting.
- C. Additional watering shall be made at least once every week, or as directed by the Engineer based on weather conditions, until final acceptance of the plant material.

3.5 FERTILIZING

- A. During backfill operations, place fertilizer in upper foot of back fill around perimeters at a rate of two ounces per foot of diameter of plant pit, or as recommended by manufacturer.

3.6 MULCHING PLANTS

- A. Application of mulch should only occur after planting operations have been completed and initial watering has taken place. Mulch shall be applied no later than forty-eight hours after planting.
- B. Mulch shall be applied to a maximum of 3 inches in depth for all individual trees and planting beds, as indicated graphically or verbally on the drawings.
- C. Where mulch abuts seeded lawn areas or other finish grade materials, edge of planting bed shall be cut smooth and cleanly. Mulch shall be placed carefully so as not to spill into adjacent areas. Any excess or spilled mulch shall be promptly removed from the project area. The cost of the mulch is incidental to new plantings.

3.7 GUYING AND STAKING

- A. Immediately after planting, stake trees (tree staple) as indicated on the drawings or as directed by Engineer.
- B. Install tree staples at locations indicated on drawings. Install per manufacturers recommendations.

3.8 TRUNK WRAPPING

- A. Remove all trunk wrap and trunk protection devices prior to staking and guying operations unless otherwise directed by the Engineer.

3.9 ANTIDESSICANT SPRAYING

- A. Spray antidessicant as directed by the manufacturer's recommendation and as approved by the Engineer.

3.10 TAGS AND LABELS

Leave all tree tag and label seals unbroken and visible on plant material until final inspection. Remove all seals immediately after final inspection.

3.11 PLANT CARE

- A. Contractor shall provide plant care for the duration of the Maintenance and Establishment periods
- B. During the 60 day Maintenance Period, plants shall be inspected for watering needs at least twice each week using moisture meters supplied by the Contractor. In addition, during the portion of the Establishment Period occurring between May 1 and November 1, the plants shall be inspected weekly using moisture meters.
- C. Plant care shall consist of keeping the plants in a healthy growing condition. Plant care shall include watering, weeding, pruning, re-mulching, and removal of dead material, resetting plants to proper grades or upright position, and maintaining the planting saucer. Treatment of invasive species shall be as described below.
- D. Trees and shrubs shall be pruned, if necessary, following planting and in accordance with the American Nurserymen's Association Standards for Class I, fine pruning, to preserve the natural character of the plant. All dead wood or suckers and all broken or badly bruised branches shall be removed. Do not cut leaders.
- E. Any decline in the condition of new plantings shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional arborists and/or horticulturists to inspect plant materials and to identify problems and recommend corrective procedures. The Engineer shall be immediately advised of such actions. Inspection and recommendation reports shall be submitted to the Engineer.
- F. Absolutely no debris may be left on the site. The Contractor shall repair any damage to site as directed by the Engineer, at no additional cost.

3.12 INVASIVE PLANT CONTROL

- A. Planting beds shall be monitored for growth of invasive species, in particular, Japanese Knotweed. All invasive plants shall be either manually removed such that the entire root system is removed or shall be treated with herbicide during the most effective time period. Herbicide application for invasive control in planting beds shall be incidental to the planting items.

3.13 MAINTENANCE PERIOD: 60 DAYS

- A. The Maintenance Period shall begin immediately after each plant is planted and shall continue for a minimum of 60 days following the completion of all planting installations, or until the Conditional Acceptance of all planting work, whichever is a longer period of time.

- B. At the end of the Maintenance Period, the Contractor will request inspection by the Engineer at least 10 days before the anticipated date of inspection.
- C. At the time of inspection, if the plant materials and workmanship are acceptable to the Engineer, the Engineer shall issue a written Certificate of Conditional Acceptance to the Contractor. The date of the inspection shall establish the end of the Maintenance Period and the commencement of the two-year Establishment Period for planting work.
- D. Inspection shall be as follows:
 - 1. Plants shall be alive and in satisfactory growth at that time. The Contractor is responsible for arranging inspection early enough in the season to allow adequate time to procure and install replacement material. Plants found to be unacceptable shall be removed promptly from the site and replaced immediately or during the next normal planting season. Contractor is responsible for replacing any plants found unacceptable prior to this inspection. Upon acceptance of the work of replacement planting, the Engineer shall issue a written Certificate of Final Acceptance for all plants installed under this Section to the Contractor.
- E. If in the Engineer's opinion, plant materials and/or workmanship are deficient, acceptance will not be granted, and the Maintenance Period for all the plants shall be extended until plant replacements are made or other deficiencies are corrected. All dead and unsatisfactory plants shall be removed promptly from the project. Replacement plants shall conform in all respects to the Specifications for the original plants and shall be planted in the same manner.

3.14 WARRANTY PERIOD: 18 MONTHS

- A. The purpose of the Warranty Period is to warranty plants for (18) months. The Contractor shall be responsible for replacing plants at any time throughout the (18) months period per the request of the Engineer. The Warranty Period shall begin immediately after Certificate of Final Acceptance is provided and shall continue for (18) months.
- B. If in the Engineer's opinion, plant materials and/or workmanship are deficient, the contractor shall replace the plants during the Warranty Period until plant replacements are made or other deficiencies are corrected. All dead and unsatisfactory plants shall be removed promptly from the project. Replacement plants shall conform in all respects to the Specifications for the original plants and shall be planted in the same manner.
- C. Decision of Engineer as to necessity to replace any plant materials or repair any defects on workmanship, or cause of any destruction or loss, impairment or failure to flourish, shall be conclusive and binding upon Contractor. Replacements shall be of same species and size as specified on Plant List. All plant replacements shall be inspected, sealed, furnished, planted and mulched as specified herein at Contractor's expense.
- D. Stakes and guying, if any, shall be removed from all plants before Final Acceptance.

END OF SECTION

SECTION 33112

DREDGING AND SITE WORK FOR INTAKE FILTER AND SLED

PART 1 - General

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This item shall consist of providing all labor, equipment, materials, incidental work, and construction methods necessary to finish all dredging and site work for intake filter and sled complete and in place, at the locations shown on the plans, or as directed by the Engineer. Including but not limited to: providing adequate safety measures including temporary facilities, removal and resetting of existing electrical components (i.e. aerators), properly removing and relocating existing dredged materials to limits shown in plans, handling and disposal of water to facilitate rip rap placement, earth and rock excavation and disposal, grading, backfilling, providing additional rip rap, miscellaneous items and any other components not specifically covered in other project specifications, for the construction and installation of the intake filter and sled. Included in this work shall be the preservation from injury or defacement of vegetation and objects designated to remain also included is the coordination of other work within this contract.
- B. Related Work: The following work contains requirements that may refer to this section.
 - 1. Division 33, Section 1114, Horizontal Centrifugal Pump Variable Speed
 - 2. Division 33, Section 1115, Well Control Panels and Integration
 - 3. Division 22, Section 1113, Water Distribution Piping
 - 4. Division 32, Section 8400, Irrigation System

1.3 SUBMITTALS

- A. Submit in accordance with Division 01 General Requirements
 - a. Submit plan for materials and methods to complete work

1.4 QUALITY ASSURANCE

- A. Consideration given only to manufacturers who demonstrate successful experience in manufacture, operation, and servicing equipment of type, size, performance equal to that specified in the City of Hartford.

PART 2 – MATERIALS

- A. Rip Rap - sized per drawings and conforming to the requirements of Form 818.

PART 3 - Installation

- A. General: Provide all materials, equipment, and labor necessary to finish all dredging and site work for intake filter and sled complete and in place. The Contractor shall dispose of all existing materials, in a satisfactory and legal manner.
- B. COORDINATION
 - 1. Coordinate with other trades to the fullest extent possible.
 - 2. Provide an efficient, well-coordinated arrangement without conflict or sacrifice of design intent.
- C. CLOSEOUT ACTIVITIES
 - 1. Provide in accordance with Division 01 General Requirements.
 - 2. Upon completion of all installation work, Contractor shall remove all leftover materials and equipment from the site in a safe and legal manner.

END OF SECTION

SECTION 33-1113

WELL PUMPS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Furnish, install, test, and leave ready for operation Well Pumps complete with all appurtenances as specified or required for a complete installation. The Contractor shall provide all labor and miscellaneous material to supply, install, field plumb and wire the pumps. This includes removal of existing pumps and installing new pumps, including but not necessarily limited to the following:

1. The work includes coordinating with the well control panel vendor and electrician as needed.
2. Repairs and modifications to the existing well components including but not limited to pitless adaptors, wiring, pvc pipe, line checks, conduits, and related as shown on the drawings.

- B. Related Work: The following work contains requirements that may refer to this section.

1. Division 33, Section 1115, “Well Control Panels and Integration”.

1.3 SUBMITTALS

- A. Submit in accordance with Division 01 General Requirements

- a. Bill of materials (BOM) for each item, including name or number and component description, quantity, manufacturer name and model number for each component used in fabrication. BOM: keyed to easily correlate components shown in bill of materials with components shown on control panel equipment layout Drawings.
- b. Manufacturer’s literature for each component identified on BOM. Clearly designate part number with highlights or arrows.

1.4 QUALITY ASSURANCE

- A. The selected contractor shall have a State of Connecticut J1 license.
The approved supplier and installer is The Stephen B Church Company, Oxford, CT, at 203 888 3132, Mr. James Duncan, Duncan.James@wseinc.com, 203-627-8006.

- B. One of the two (2) pumps to be replaced is located 1200 LF +/- away from the equipment room. The Contractor is responsible for providing adequate equipment as needed to avoid issues e.g. voltage drop, harmonic distortion etc. to the pumps. This equipment shall be considered incidental to this item.

PART 2 – MATERIALS

2.1 General:

- A. The replacement pump shall be a Goulds 45 GS 50 with a 5 horsepower 230-volt three phase Centripro motor, selected to deliver 45 gallons per minute at 320 feet total discharge head by catalog curve.
- B. The pump and motor shall both be 4-inch nominal diameter, and the pump shall be of stainless-steel construction with Noryl impellers and diffusers. The pump shall have an integral check valve.
- C. The pump shall be set in the well on 240 feet of 2- inch schedule 120 PVC threaded casing, with a second check valve set between 120 and 140 feet. This check valve shall be a 2-inch 80 S 6 VFD Flomatic check valve.
- D. Submersible motor cable shall be #10 double jacketed, three wire plus ground, specifically for submersible pump duty, with a watertight splice between the motor leads and the cable. Cable shall be run to the top of the well and suitably tied to the drop pipe at least every ten feet.
- E. A ¾ inch schedule 40 PVC flush joint threaded stilling tube shall be installed from the top of the well to within ten feet of the pump intake for use in obtaining water level readings.
- F. The Contractor shall provide and install an Aquavar Solo 3AS50 pump controller in a NEMA 3 R rainproof indoor/ outdoor enclosure. Provide input voltage for the controller of 230-volt single phase and a suitable location to house the drive.

PART 3 - EXECUTION

3.1 EXISTING EQUIPMENT TESTING

- A. Check the conditions of all the existing equipment to remain in place including but not limited to wiring, cables, etc. Provide a written report on the condition of all existing equipment to remain.

3.2 COORDINATION

- A. Coordinate with other trades to the fullest extent possible.
- B. Provide an efficient, well-coordinated arrangement without conflict or sacrifice of design intent.

3.4 INSTALLATION AND MOUNTING

1. Install per manufacturer guidelines, as the drawings indicate, and as directed by the Engineer during construction. In case of interference with other Work, proceed as directed by Engineer.

3.4 TESTING

1. Upon installation of the pump and drive, the contractor shall conduct a 12-hour yield test on the well, and shall measure flow rate and water level at the following intervals:
 2. Every minute for the first ten minutes after startup
 3. Every five minutes from ten minutes to 60 minutes after startup
 4. Every hour thereafter until ten hours after startup
 5. Shut down at ten hours after startup
 6. Recovery readings as follows
 7. Every minute for first ten minutes after shut down
 8. Every five minutes from ten minutes to sixty minutes after shut down
 - Every fifteen minutes for the last hour

3.5 CLOSEOUT ACTIVITIES

1. Provide in accordance with Division 01 General Requirements.

END OF SECTION 33 1115

SECTION 33114

HORIZONTAL CENTRIFUGAL PUMP VARIABLE SPEED

PART 1 - General

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Furnish, install, test, and leave ready for operation a factory “packaged” type prefabricated, skid mounted, fully automatic variable speed pumping system (systems) for turf irrigation. The pumping system shall automatically maintain a constant discharge pressure regardless of varying flow demands within the station rating. Pumping system shall conform to the following specifications in all respects. This specification covers the minimum requirements; however, it should not be construed as all inclusive. It is the successful vendor's responsibility to include all necessary appurtenances to provide for a complete, automatic, smooth operating, and reliable pumping system. The manufacturer shall supply a complete set of general arrangement drawings, electrical power schematics, and control schematics in the operations & service manual. The Contractor shall provide all labor and miscellaneous material to supply, install, plumb and wire the system. This also includes but not necessarily limited to the following:
 - 1. Integrate pond water level sensors into equipment from Well Control Panels to allow for control of Deep Well Pump(s) when pond water level is too high or low.
 - 2. The work includes coordinating with the pump supplier, building vendor, electrician and pumps station equip vendor as needed.
- B. Related Work: The following work contains requirements that may refer to this section.
 - 1. Division 33, Section 1115, Well Control Panels and Integration
 - 2. Division 22, Section 1113, Water Distribution Piping
 - 3. Division 32, Section 8400, Irrigation System

1.3 SUBMITTALS

- A. Submit in accordance with Division 01 General Requirements
 - a. Bill of materials (BOM) for each control panel, including panel tag name or number and component description, quantity, manufacturer name and model number for each component used in fabrication. BOM: keyed to easily correlate components shown in bill of materials with components shown on control panel equipment layout Drawings.
- B. Manufacturer’s literature for each component identified on BOM. Clearly designate part number with highlights or arrows.

- a. Equipment layout drawings
 - b. Panel communication diagrams
 - c. Power wiring diagrams
- C. Shop Drawings
- a. Contractor may provide letter with copy of fabrication drawings confirming fabricator will fabricate equipment as specified on shop drawing
- D. Closeout and Maintenance Material Submittals: per Division 01 General Requirements.
- E. As-Built Drawings
- a. After fabrication and factory acceptance testing is complete, panel shop shall provide Drawings of equipment, representing as-built conditions. Submit panel Drawings in AutoCAD DWG and Adobe PDF file formats, on USB drive or DVD-R media.

Submit with panels at delivery.

Contractor may provide legible red-line markups of shop level Drawings from shop if used in lieu of Shop Drawings.

1.4 QUALITY ASSURANCE

- A. Consideration given only to manufacturers who demonstrate successful experience in manufacture, operation, and servicing equipment of type, size, performance equal to that specified in the City of Hartford.

1.5 POND LEVEL CONTROLS

- A. Pond Level Controls As part of the Irrigation Pump control system, the pond level shall be continuously monitored by a liquid level sensor (lake level). When low level is sustained for a period of time, an electrical signal shall be directed to start the well pumps. Signal shall be maintained until reservoir is filled to the pre-selected height. Upon cessation of signal, relay shall drop out and well pumps shall stop. Provide and install the pressure transducer to monitor the irrigation pond level. Also, provide and install all wiring, conduit and appurtenances between pumping control panel, pressure transducer and starter for well pumps.

1.6 GUARANTEE

- A. The Contractor shall obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law.
- B. In addition to the manufacturers guarantees the Contractor shall warrant the entire system, both parts and labor for a period of one (1) year from the date of acceptance by the Owner.

- C. As part of the one-year warranty the Contractor shall perform all required maintenance during that period.
- D. Should any problems develop within the warranty period because of inferior or faulty materials or workmanship, they shall be corrected to the satisfaction of the Owner's Representative at no additional expense to the Owner.
- E. A written warranty showing date of completion and period of warranty shall be supplied upon completion of the project.

1.7 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. Contractor shall include in their Bid an allowance two (2) hours of instruction of Owner and/or Owner's personnel upon completion of check/test/start-up/adjust operations by a competent operator (The Owner's Representative office shall be notified at least one (1) week in advance of check/test/start-up/adjust operations).
- B. Upon completion of work and prior to application for acceptance and final payment, a minimum of three (3) three ring, hard cover binders titled MAINTENANCE AND OPERATING INSTRUCTIONS FOR THE PUMP SYSTEM, shall be submitted to the Owner's Representative office. After review and approval, the copies will be forwarded to the Owner. Included in the Maintenance and Operating binders shall be:
 - 1. Table of Contents
 - 2. Written description of System.
 - 3. System drawings:
 - a. One (1) copy of the Shop drawings;
 - b. One (1) copy of the Record Drawings;
 - 4. Listing of Manufacturers.
 - 5. Manufacturers' data where multiple model, type and size listings are included; clearly and conspicuously indicating those that are pertinent to this installation.
 - a. Operation: controller operating manual.
 - b. Maintenance: including complete troubleshooting charts.
 - c. Parts list.
 - 6. Winterization and spring start-up procedures.
 - 7. Guarantee data.

PART 2 – MATERIALS

2.1 General:

- A. Manufacturer: The pumping system shall be of the type manufactured and supplied by DAF Services, Inc., 20 Lawnacre Road, Windsor Locks, CT 06096. The station shall be of the model number and capacities as shown in the attached technical data sheet. No alternates will be accepted.
- B. The pumping system manufacture shall have 24/7 on call service and will have certified service personal on staff within the State of Connecticut.
- C. Pump station skid perimeter frame shall be heavy C channel. Skid substructure shall be Box steel. Pump mounting plate shall be ½” mill plate. Continuous weld of all plating on skid. Horizontal centrifugal VFD pump station built by a single manufacturer. All equipment including but not limited to pumps, motors, valves, instrumentation and controls shall be mounted on a common structural steel base to form a complete operating pumping station.
- D. Station base. The pump(s) frame base shall be designed and fabricated to provide proper structural support for all attached equipment. The base shall supply sufficient rigidity to withstand the stresses of reasonable and competent transportation to site, off loading, installation, and operation. Main structural members shall be constructed from heavy weight channel or I-beam steel. Provisions shall be made in the station base for off-loading and handling the station at the site of installation. Critical frequency of complete pump station shall be above operating frequencies.
- E. Discharge Piping. All piping shall be constructed from ASTM A105 schedule 40 pipe or heavier as required to maintain a 3 to 1 pressure safety factor (including 1/16" corrosion allowance). All piping shall be hydrostatically tested to 150% of maximum shutoff pressure.
- F. Paint. Two-part blasting process: First steel grit, Second aluminum oxide media. Two-part powder coat paint process
- G. Bolts. All bolts used in the assembly of the pumping system shall be zinc plated to retard corrosion.
- H. Pumps. The main irrigation pump(s) shall be of the horizontal centrifugal type with flow and head defined in the attached technical specifications. The horizontal pumps shall be manufactured according to the standards of the Hydraulic Institute and to ANSI specification No. B58.1. The pump casing shall be ASTM 48, class 30, cast-iron capable of hydrostatic test @ 150% of maximum discharge pressure and have both suction and hub replaceable wear ring. All mating parts shall have a register fit to ensure alignment.
 - 1. The impeller shall be an enclosed, single piece bronze or cast-iron casting completely machined on all outside surfaces and statically balanced at time of pump assembly. The impeller shall be keyed to the shaft and securely fastened with a vibration resistant lock screw and washer.
 - 2. The packing box shall contain a mechanical seal for the specific application.

3. The impeller shall not contact the suction or hub wear ring under any operating load condition.
4. The pump and motor shall be connected by an ASTM 48, class 30, cast-iron bracket incorporating a full isolating shield with dual slinger rings to prevent moisture from entering the front motor bearing. The main irrigation pump shall be as manufactured by Goulds, or Cornell, or Berkeley or approved equal.
5. A pressure maintenance pump shall be provided to maintain system pressure during non irrigation periods. The pump end shall be of the vertical multi-stage design with the motor mounted directly to the top of the pump.
6. The pump suction/discharge chamber, motor stool and pump shaft coupling shall be constructed of cast iron. The impellers, pump shaft, diffuser chambers, outer discharge sleeve and impeller seal rings or seal ring retainers shall be constructed of stainless steel. The impellers shall be secured directly to the pump shaft by means of a splined shaft arrangement. Intermediate and lower shaft bearings shall be Tungsten Carbide and Ceramic or Tungsten Carbide and Bronze. Pumps shall be equipped with a high temperature mechanical seal assembly with Tungsten Carbide/Carbon or Tungsten Carbide/Tungsten Carbide seal faces. Pump shall be as manufactured by Goulds or approved equal.
7. Motor(s) for the irrigation pump shall be of United States manufacture, PREMIUM EFFICIENT close-coupled type with rodent screens on all ventilating passages and be open-drip proof, 1.15 service factor, and class F insulation. Motors shall be wound for the starting configuration as called out in the technical data sheet. Design pump brake horsepower shall not exceed 98% of motor horsepower exclusive of service factor. Maximum pump run out horsepower shall not be greater than 8% higher than motor rating exclusive of service factor. The motor bearings shall be selected to withstand thrust loads and have a minimum life of 5 years continuous operation. The motor shaft shall be high-strength steel protected by a bronze shaft sleeve secured to the shaft to prevent rotation. All pump motors shall have 120 VAC space heaters. Heaters shall be de-energized when the motor starts. Motors shall be as manufactured by U.S. Electric, or Baldor or Reliance or approved equal.
 - a. Motor for pressure maintenance pump shall be sized to ensure the pump is non-overloading when operating on the specified pump curve. The motor shall be of the horsepower, voltage, phase and cycle as called out in the technical data sheet. Motor design shall be of the open drip proof, with a NEMA C face design operating at a nominal 3450 RPM with a minimum service factor of 1.15. Lower motor bearings shall be adequately sized to ensure long motor life. All pump motors shall have 120 VAC space heaters. Heaters shall be de-energized when the motor starts. Motor for pressure maintenance motor shall be as manufactured by Baldor or approved equal.
8. Pump Check Valve. Pump check valves shall be provided on the discharge of each pump and sized per the technical data sheet. They shall be of the silent operating type that begins to close as forward velocity diminishes and be fully closed at zero velocity preventing flow reversal. Valve bodies shall be cast from grade 35 cast-iron or better and shall be free from blow holes, sand holes, and other impurities. The valve design shall incorporate a center guided, spring loaded poppet, guided at opposite ends and having a

short linear stroke that generates a flow area equal to the pipe diameter. Internals shall be machined bronze disc, seat, and stem guide. Seat shall be Buna-N to provide resilient sealing. Dual disc style check valves are not acceptable. Valves shall be sized to permit full pump capacity to discharge through them without exceeding a pressure drop of 2.5 PSI. Check valve shall be as manufactured by Valmatic or approved equal.

9. Pump Isolation Valves: Discharge. Valve shall be of the lug style butterfly type. Valve shall have one piece body cast from ASTM A126 cast iron. Stem shall be 416 stainless steel. Disc shall be nickel plated ductile iron. Stem bushings shall be Acetyl to prevent stem seizure to body during prolonged periods of non-use. Seat shall be Buna-N elastomer, one piece construction, and shall also form the flange sealing gaskets. Valves 8" and smaller shall have a lever operator. Valves 10" and larger shall have a gear operator with hand wheel. Valve shall be rated at 200 PSI bubble shutoff. Station isolation valve shall be as manufactured by Flomatic. A grooved coupling will be provided for expansion and vibration dampening between the pump and discharge manifold. Grooved coupling shall be as manufactured by Flomatic, Gruv-Lok or approved equal.
10. Pump Isolation Valves: Suction. Pump isolation valves shall be installed on the inlet of the pump to completely isolate the individual pumps. Valve shall be of the lug style butterfly type. Valve shall have one piece body cast from ASTM A126 cast iron. Stem shall be 416 stainless steel. Disc shall be nickel plated ductile iron. Stem bushings shall be Acetyl to prevent stem seizure to body during prolonged periods of non-use. Seat shall be Buna-N elastomer, one piece construction, and shall also form the flange sealing gaskets. Valves 8" and smaller shall have a lever operator. Valves 10" and larger shall have a gear operator with hand wheel. Valve shall be rated at 200 PSI bubble shutoff. Pump suction isolation valve shall be as manufactured by Flomatic.
11. Pressure Relief Valve. A pilot operated modulating pressure relief valve shall be included and sized per the technical data sheet. The valve shall be set 7 to 10 PSI above operating pressure and will relieve when inlet pressure exceeds spring setting on pilot. Valve shall be quick opening and slow closing to minimize surging. Valve body shall be cast iron with 125 lb. inlet and outlet flanges and shall be rated for 200 PSI. A wye strainer shall be installed in the inlet side of the valve body to provide clean water to the CRL pilot. A wafer style butterfly valve shall be installed on the inlet and outlet of the relief valve. Specifications for this isolation valve will be the same as for the station isolation valve found later in the specification. Relief valve shall be as manufactured by CLA-VAL or approved equal.
12. Pressure Gauge. A pressure gauge shall be mounted on the suction and discharge header with an isolation ball valve. All gauges shall be silicon filled to reduce wear due to vibration. Accuracy shall be within 2%. Gauge diameter shall be 4" minimum. Range shall be at least 30% higher than the highest pressure attainable from the pumps at shutoff head conditions. Stainless steel back & bronze internal. Pressure gauge shall be as manufactured by Wika or approved equal.
13. Station Isolation Valve. Station isolation valve shall be installed on the discharge of the pump station to completely isolate the pumping system from the irrigation system. Valve shall be of the lug style butterfly type. Valve shall have one piece body cast from ASTM A126 cast iron. Stem shall be 416 stainless steel. Disc shall be nickel plated ductile iron. Stem bushings shall be Acetyl to prevent stem seizure to body during prolonged periods

of non-use. Seat shall be Buna-N elastomer, one piece construction, and shall also form the flange sealing gaskets. Valves 8" and smaller shall have a lever operator. Valves 10" and larger shall have a gear operator with hand wheel. Valve shall be rated at 200 PSI bubble shutoff. Station isolation valve shall be as manufactured by Flomatic or approved equal.

I. Electrical

1. General: Provide complete instrumentation and controls to automatically start, stop and modulate pump speed(s) to pump variable flow rates smoothly, efficiently and reliably at a constant discharge pressure. Full alarms and safety features needed to protect the equipment and irrigation piping system. Control panel shall be UL listed as a complete assembly. Non-UL listed panels are not acceptable.
2. Control Enclosure. Controls shall be housed in a NEMA 4 enclosure with integral latches. The control enclosure should be constructed of 12-gauge steel and the back plate assembly shall be constructed of 12 gauge steel. All indicating lights, reset buttons, selector switches and the operator interface device shall be mounted on enclosure door and be rated NEMA 4. All internal components shall be mounted and secured to the removable back plate assembly. A closed type cooling system shall be included to cool the enclosure and reject heat from the VFD. Open type cooling systems allowing outside ambient air to enter the panel are not acceptable. No water line connections shall be permitted inside of the control enclosure. Control panel to be mounted on skid.
3. Cooling. A closed type cooling system shall be included to cool the enclosure and reject heat from the VFD. Cooling system shall consist of an air/water heat exchanger with integral circulation fan. Cooling water on/off control will be via solenoid. Solenoid will be energized when the VFD is operating. No water line connections shall be permitted inside of the control enclosure. Open type cooling systems allowing outside ambient air to enter the panel are not acceptable.
4. Lightning and Surge Arrester. All electrical equipment shall be protected by a U.L. approved Category C and Category B surge arrester to suppress voltage surges on incoming power. The device under IEEE C62.41 Category C will withstand a impulse of 10Kv/10Ka and Category B to withstand a ring wave of 6Kv/500a and a impulse of 6Kv/3Ka. Pass voltage for a 480v device to the end equipment shall not exceed 1500V-1800V when subjected to a 8ms * 20ms wave shape resulting in the following performance statistics: 3720 joules minimum with a power dissipation of 82,500,000VA at 1800V maximum pass voltage to the protected equipment. Response time shall be less than 5 nanoseconds.
5. Main Disconnect. A non-fusible main disconnect shall be provided to completely isolate all controls and motor starting equipment from incoming power. Main disconnect shall have a through the door operator and shall be sized as shown in the technical data sheet. Disconnect shall be as manufactured by ABB or approved equal.
6. Control Power. Power for the controls shall be provided by a control power transformer which will provide 120-volt, single phase power for the pumping system control operation. Control power transformer shall not be used for any other external load. The control power transformer shall be protected on the primary side by control limiting fuses

of adequate size and voltage rating. All control components will be protected by time delay circuit breakers of adequate size. The control power transformer shall be as manufactured by Acme or approved equal.

7. Motor Starting Equipment. All motor starters for the pumping station shall be mounted on a single back panel in a single enclosure as specified in section 3.10. Motor starters shall meet I.E.C. standards and shall be rated for a minimum of 1,250,000 operations. Each main irrigation motor shall have dual contactors which are mechanically interlocked to allow the VFD to operate on any of the motors as called out in the technical data sheet. Motor overload relays shall be I.E.C. rated class 10 ambient compensated. Fuses shall supply short circuit protection to each motor and shall be rated for a minimum 200,000 amp interrupting capacity. Motor starters shall be as manufactured by Allen Bradley or approved equal.
8. Variable Frequency Drive. The variable speed drive shall be a digital, pulse width modulation (PWM) variable frequency drive (VFD) with IGBT transistors. The VFD shall have a minimum wire to wire efficiency of 98.5% and shall be rated up to 550-volt operation in order to eliminate nuisance tripping at marginally high voltage conditions. Front end shall be protected by fast acting semiconductor fuses. Any VFD error messages shall be displayed on a 40-character LCD. The following fault protection circuits shall be included: Over current (200%), Overvoltage (130%), Under voltage (60%), Over temperature (70 Deg. C), Ground fault, and Motor overload. The VFD shall be capable of starting into a rotating load and accelerate or decelerate to setpoint. The VFD shall have an automatic extended power loss ride through circuit which will utilize the inertia of the pump to keep the drive powered. Minimum power loss ride-through shall be one cycle based on full load and no inertia. The VFD shall be optimized for a 3 kHz carrier frequency to reduce motor noise. The VFD shall employ three current limit circuits to provide "tripless" operation. The following operating information shall be displayed on the VFD LCD: KWH, elapsed time, output frequency (Hz), motor speed (RPM), motor current (amps), and voltage. Line reactor will be installed on input of VFD to protect against voltage transients. The VFD LCD display shall continuously scroll through all operating information and shutdown faults while the drive is running and while stopped. The VFD shall be as manufactured by ABB or approved equal.
9. Pressure Transducer. Pressure transducer shall be utilized for providing all pressure signals for the control logic. Pressure transducer shall be a solid-state bonded strain gage type with an accuracy of plus/minus 0.20% and constructed of 316L stainless steel. Transducer shall be rated for station discharge pressure as shown on technical data sheet, and shall provide gauge pressure output, rather than an absolute. Pressure transducer constructed of plastic is not acceptable.
10. Flow meter. The pump station shall have a flow sensor installed which will provide the pump station flow rate and total flow through the operator interface device (OID) as specified in Section 3.55. The flow sensor shall be a six bladed design which provides a low impedance signal proportional to the flow. The accuracy shall be plus/minus 2% of actual flow rate between flow velocities of 1-30 ft./sec. A flow meter run shall be included with a minimum of 5 pipe diameters straight run upstream and 2 pipe diameters downstream for proper meter accuracy. Meter run shall be sized as shown in technical data sheet. Flow sensor shall be as manufactured by Data Industrial or approved equal.

11. Controls. All control logic shall be handled by an industrial grade programmable logic controller (PLC). PLC shall provide demand controlled sequential pump start-up, shutdown and safety features through its pressure sensing, flow sensing and voltage sensing devices. PLC shall have LED indicators for input, output, and diagnostic read-outs showing PC Run, CPU Fault, and two communications, (battery and force). An LED visual status light is provided for each I/O to indicate on/off status. PLC shall be provided with a built in EEPROM, capacitor, and battery for memory backup. All logic for system control, timing, and control of VFD speed shall be handled by the PLC. A separate set point controller is not acceptable. PLC shall have a built-in clock calendar. The PLC shall be as manufactured by Allen Bradley or approved equal.
12. Control software shall be touch key driven, fully documented, and allow user to easily change ALL operational parameters. All control values shall be via touch screen input, with clearly stated function. Numeric register parameter systems are not acceptable.
 - a. Alarms and shutdowns:
 - Low & high discharge pressure
 - Low water level (Attempts restart) *
 - Low & High Voltage, phase loss, phase reversal (Attempts restart)*
 - Pump overload
 - Pump over temp
 - VFD alarm (Attempts restart) *
 - b. All alarms will be indicated by a red general alarm light. Specific alarm conditions along with procedures for correction will be displayed in English on the operator interface display (OID).
 - c. Phase failure and low voltage safety circuit shall also be provided to retire the pumping system if it experiences low voltage, phase failure or phase reversal as monitored at line-side of control enclosure. Phase monitor shall have a time delay allowing for transient low voltage during motor starting and to allow maximum motor protection. Single incoming phase monitor safety circuit is not acceptable.
 - 1) Panel face switches and lights:
 - Individual pump on/off switches
 - System Hand/Off/Automatic switch
 - d. PLC bypass switch mounted inside panel allows user to manually operate pumps should PLC fail.
 - e. Software will be included to ramp up irrigation system pressure automatically and gradually to the desired operating pressure (i.e., 1 PSI every 4 seconds) without overshooting design pressure. This feature operates whenever pressure drops 10 psi below set point pressure. This ramp up time is fully adjustable by the operator. This control feature is based on an increase in pressure over a pre-defined time period. The acceleration control on the VFD is NOT an acceptable means of adjusting pressure ramp up speed.
 - f. VFD output frequency shall be used for shutting down last VFD driven pump. Controls and software shall incorporate a method to eliminate excessive cycling of

VFD pump at very low flow conditions, yet not run the pump excessively at no flow conditions.

- g. Automatic alternation of VFD driven pumps. This shall be accomplished by incorporating dual mechanically and electrically interlocked contactors allowing alternation of the VFD between pumps.
 - h. Real time clock calendar allows PLC to internally provide all date and time functions used above.
 - i. Shutoff algorithm for fixed speed pumps to minimize pump cycling while also remaining responsive to sudden flow reductions. Minimum run timers alone for minimizing fixed speed pump cycling is not acceptable.
 - j. Full manual operation capability with panel face mounted speed potentiometer for manually adjusting VFD speed.
 - k. All pump station shutdowns shall be of the controlled type that sequentially phase pumps off at user selectable intervals to reduce water hammer within the irrigation system.
 - l. The pump station software program shall be user friendly enough to enable the set point pressure from being raised or lowered by the end user at the pump station or through the remote monitoring software package if provided. The pump station software ladder logic shall be written in such a way that no other value would require changing if the set point pressure had to be adjusted. Pressure maintenance pump and main irrigation pump start pressures, the pressure maintenance pump stop pressure, low discharge shutdown and high discharge shutdown shall not be at a specific value but a differential pressure off of set point (i.e., pressure maintenance pump (PMP) to start 5 psi below set point and stop 5 psi above setpoint).
13. Operator Interface Device (OID). Mounted in the enclosure door shall be an operator interface for logical display of all pump station functions. The operator interface shall be NEMA 4 rated for mounting in the control enclosure door. The operator interface shall be touch sensitive with intuitive on-screen user instruction for ease of operator use. The use of buttons or keys or off-screen user instructions shall not be permitted. The operator interface shall be color with viewing an area measuring not less than 10" diagonal.

The operator interface shall allow the user to view and modify all pertinent operation parameters. The operator interface shall incorporate password protection for modification of critical pump station parameters.

The operator interface capabilities shall include but are not limited to the following:

In addition to normal data entry keys, the device shall include a minimum of the following function keys labeled:

- a. Pump control:
 - 1) Mode Select switch -- allows automatic bypass mode of operation which can be used if VFD should fail.
 - 2) VFD selector switch -- in manual mode, allows user to select which pump will be run off the VFD

- 3) Reset -- Acknowledges pump station alarms.
 - 4) Speed control -- in manual mode allows user to adjust VFD pump speed (via touch screen)
 - 5) Low discharge pressure override switch -- disables low discharge pressure alarm (via touch screen)
- b. User shall be able to field select either of two modes of VFD operation. Auto switch VFD option allows VFD to sequentially start each pump. The standard mode of operation starts the first main pump on the VFD, and the remaining pumps start across the line as required.
 - c. Display of pressure in PSI, flow in GPM and total gallons pumped in thousands of gallons. Current system set point, system pressure, and GPM, shall be always displayed, on all sub-screens, to preclude toggling between screens to see current system status.
 - d. Separate display for total gallons pumped with operator resets capability.
 - e. Separate display for total gallons pumped within a daily, weekly, monthly, and Annual total
 - f. Pump control and running status.
 - g. Individual pump total elapsed run time display, with operator reset capability
 - h. Alarm status with time stamping and display of pump station conditions at shutdown. Display shall retain last 12 faults. Operator shall be able to clear alarm without clearing fault log. Operator shall also be able to clear fault log.
 - i. Status of optional auxiliary equipment such as strainer flushing or pond fill pumps with manual-on override capability.
 - j. Override for automatic pump alternation.
14. Codes. The control panel with controls shall be built in accordance N.E.C., and U.L. standards. All equipment and wiring shall be mounted within the enclosure and labeled for proper identification. All adjustments and maintenance shall be able to be done from the front of the control enclosure. A complete wiring circuit and legend with all terminals, components, and wiring identification shall be provided. Main disconnect shall be interlocked with door.
 15. Operation. During non irrigation times, the pressure maintenance pump (PM) will cycle on and off as required to maintain irrigation system pressure. The start and stop pressures shall be a differential off of set point. The cycling pressures can be user selected and can be set substantially below normal set point pressure, if desired. If the PM pump cannot maintain the desired pressure, then the VFD will start the first pump and will gradually ramp the pressure up to desired irrigation pressure. The start pressure of the VFD pump shall be a differential below the set point. The pump speed will be modulated to hold a constant discharge pressure regardless of flow. As the flow rate increases and the VFD pump can no longer maintain pressure while at maximum speed, the next sequential pump will be started and the VFD driven pump will accordingly reduce its speed and modulate. An algorithm shall be included for accurately reducing the VFD pump speed as the next sequential pump is started so that no pressure surges are generated during the transition (even with across the line starting). As the flow continues to increase, pumps will sequentially be started until all pumps are running. As the flow begins to decrease, pumps will be sequentially turned off until only a single VFD driven pump is operating. When a no flow condition occurs, the VFD pump shall be turned off.

16. Vacuum Priming System. Manufacturer shall incorporate a vacuum pump assembly to pull prime to pump suction manifold, as well as provide a loss of prime input to pump station PLC. Vacuum pump assembly shall consist of: prime sensing tube with start/stop probes, air release valve, dual check valves on exhaust line from air release to 1/6hp vacuum pump. Upon sensing low water level, vacuum pump shall start and continue to provide vacuum until water rises to a high/stop level. If the water level does not reach the high level within 1 minute (field adjustable time delay) the pump station will shut down and indicate a "Loss of prime fault message". The vacuum pump will continue to run, attempting to regain prime until one of two conditions are met. Condition one: the water level is pulled to the high/stop level. At which point the PLC will restart the pump station for automatic line fill and operation. Condition two: the pump is manually shut off to determine why prime cannot be made.
17. Web Based Remote Monitoring Software. The remote monitoring software shall be provided which allows user to remotely view the pump station from any web enabled device. The software shall be graphic with full mouse (point and click) control. The user shall be able to view set point pressure, acknowledge and reset fault conditions and stop the pump station in an emergency. All data collected shall be stored in a cloud-based server. Owner's account shall be password protected. A one-year renewable data plan shall be included.
18. The cloud-based storage shall have a home page "dashboard". Displayed on the dashboard shall be:
- Individual pump switch status (On, Off, Auto)
 - Indication of pump operation (On, Off)
 - System Status (Manual, Off, Auto)
 - Current Time
 - System Set point, pressure, flow, and level.
 - Alarm Status Indicator
 - Emergency Stop Button

Additionally, the dashboard shall provide access to the other system pages. These pages include:

- Flow Watch
- Lockouts
- Alarm Log
- Accumulation

The Flow Watch page will allow the user to program a maximum and minimum flow rate for a specific period of time. If the station exceeds that flow rate it shall be shut down and an alarm generated.

The Lockouts page will allow the user to program specific times that the pump station will not run. This can be done on an individual pump basis.

The system shall track and report the level of salinity in the irrigation pond.

The Alarm Log page will provide a history of alarms triggered by the station.

The user can select a start and stop calendar period for the report. Once generated on the screen the user can export the report for printing. Alarms can be reset at this page. The Image Set tab is not for use by the end user.

The Accumulation page will provide flow data to the end user. The user can select a specific start and stop calendar period for the report. The user can select either daily, weekly, or monthly reporting. Once generated on the screen the user can export the report for printing.

The system shall be capable of delivering alerts via text message or email.

The remote monitoring software shall be developed by the pumping system manufacturer.

- J. Intake Screen. The pump station manufacturer shall provide a complete suction piping system consisting of a minimum of 140' of 10" SDR 17 HDPE piping, suction screen model SPVC 10 as manufactured by Sure Flo and shall be connected to a HDPE sled with lift bag air recovery system. Air hose to be terminated on shore in a 12" Valve box set to grade.

PART 3 - Installation

- A. General: Provide all materials, equipment, and labor necessary to install all items associated with the pump station including: electrical connection, suction piping, discharge to the irrigation system, intake screen, and sled.
- B. COORDINATION
 - 1. Coordinate with other trades to the fullest extent possible.
 - 2. Provide an efficient, well-coordinated arrangement without conflict or sacrifice of design intent.
- C. Unloading and Setting. Equipment to off-load and set the pump station onto the concrete slab.
- D. Start Up. A minimum one-week notice shall be given to the Owner's Rep prior to scheduled start up date. During start up, the complete pumping system shall be given a running test of normal start and stop, and fully loaded operating conditions. During this test, each pump shall demonstrate its ability to operate without undue vibration or overheating and shall demonstrate its general fitness for service. All defects shall be corrected, and adjustments made at no cost to the owner. Test shall be repeated until satisfactory results are obtained. Start up assistance will be provided but will be limited to one 8-hour day unless otherwise specified.
 - 1. After the station startup has been completed, but before leaving the job site, a training session will be given. The training session will be given to the owner or the owner's representative to familiarize them with the pumping system operation, maintenance, and adjustments.
- E. ACCEPTANCE AND OPERATION BY OWNER
 - 1. Upon completion of the work and acceptance by the Owner, the Contractor shall be responsible for the training of the Owner's Representative(s) in the operation of the system (provide minimum 7 days written notice in advance of test). The Contractor shall furnish, in addition to spare parts, record drawings and operational manuals, copies of all available specification sheets and catalog sheets to the Owner's personnel responsible for the operation of the system.
 - 2. Conditions for acceptability of work for start of maintenance by Owner issued by Owner or Owner's Representative shall include but not be limited to:

1. Punch list items complete and approved by Owner or Owner's Representative.
2. Pump system complete and in place.
3. Record drawings complete.

F. CLOSEOUT ACTIVITIES

1. Provide in accordance with Division 01 General Requirements.
2. Upon completion of all installation work, Contractor shall remove all leftover materials and equipment from the site in a safe and legal manner.

END OF SECTION 33-1114

SECTION 33-1115

WELL CONTROL PANELS AND INTEGRATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Furnish, install, test, and leave ready for operation a factory “packaged” type Well Control Panels system complete with all appurtenances as specified or required for a complete installation. The Contractor shall provide all labor and miscellaneous material to supply, install, and field wire the system. This includes unloading, installing and anchoring the new unit to the existing composite wall., including but not necessarily limited to the following:
 - 1. Providing and installing all Well control panel(s), alarms, telemetry communication equipment and instrumentation to operate Deep Well pumps.
 - 2. The control cabinets will be relay logic control with intrinsically safe sensor interface (No Programmable Logic Controllers) to deep well level sensing.
 - 3. Single phase incoming line power will be converted by VFD(s) to drive 3 phase Deep Well Pump(s).
 - 4. Interface telemetry communications to existing Supervisory Control and Data Acquisition (SCADA) system located at the Jennings Road Facility.
 - 5. Installation and programming of redundant (local) flow data recording device installation.
 - 6. Included in this work will be to design, and interface additional graphic screens into the existing Human Machine Interface (HMI) panel. All additional graphics, trends, totalization, and historical data screens will be subject to approval by the City’s Engineering Department.
 - 7. Flow testing and inspection of existing insertion inline flowmeter, and integrated flow controller.
 - 8. Intergrate pond water level sensors into equipment from the Horizontal Centrifugal Pump Variable Speed Prefabricated Pump Station to allow for control of Deep Well Pump(s) when pond water level is too high or low.
 - 9. The work includes coordinating with the pump supplier, building vendor, electrician and pumps station equip vendor as needed.
- B. Related Work: The following work contains requirements that may refer to this section.
 - 1. Division 33, Section 1116, “Horizontal Centrifugal Pump Variable Speed Prefabricated Pump Station”.

1.3 SUBMITTALS

- A. Submit in accordance with Division 01 General Requirements
 - a. Bill of materials (BOM) for each control panel, including panel tag name or number and component description, quantity, manufacturer name and model number for each component used in fabrication. BOM: keyed to easily correlate components shown in bill of materials with components shown on control panel equipment layout Drawings.
 - b. Manufacturer's literature for each component identified on BOM. Clearly designate part number with highlights or arrows.
 - c. Equipment layout drawings for each control panel
 - d. Panel communication diagrams for each control panel
 - e. Power wiring diagrams for each control panel
- B. Shop Drawings
 - a. Contractor may provide letter with copy of fabrication drawings confirming control panel fabricator will fabricate control panels as specified on shop drawing level control panel Drawings in lieu of Shop Drawings.
- C. Closeout and Maintenance Material Submittals: per Division 01 General Requirements.
- D. As-Built Drawings
 - a. After fabrication of control panels and factory acceptance testing is complete, panel shop shall provide Drawings of control panels, representing as-built conditions. Submit panel Drawings in AutoCAD DWG and Adobe PDF file formats, on USB drive or DVD-R media.

Submit with panels at delivery.

Contractor may provide legible red-line markups of shop level Drawings from panel shop if used in lieu of Shop Drawings.

1.4 QUALITY ASSURANCE

- A. Consideration given only to manufacturers who demonstrate successful experience in manufacture, operation, and servicing equipment of type, size, performance equal to that specified in the City of Hartford.

PART 2 – MATERIALS

2.1 General:

- A. Manufacturer: The Well control panel system shall be of the type manufactured by The Berlin Instrumentation Services Group., Hartford, CT, U.S.A., or equal, approved by the purchaser prior to bid opening. For consideration of a proposed

equal system, the contractor shall furnish the following data to the architect/engineer at least 10 days prior to the date of the bid opening:

B. Contact Info:

- a. Robert Facey: rfacey@thebisgroup.net
- b. Office: (860) 810-8875 Cell: 860-818-3029

C. Control Panel

1. Panel Identification: Enclosure location in external cabinet.
2. Enclosure Mounting: Wall mount
3. Enclosure Ambient Temperature: 32 degrees (F) to 120 degrees (F)
4. Enclosure NEMA Rating: NEMA 4X
5. Indication & Horn Lights: 30mm LED Indication Lights
6. 3 Position Switch (H/O/A): 30 mm Detachable contact blocks
7. Control Panel Labels: Black vinyl / white lettering
8. Enclosure Thermal Management: Fan ventilation for temperature 80 degree (F) and higher.
9. Relay 24VDC: Idec RH2B-ULDC24V (DPDT or approved equal)
10. Relay Base: Idec SH2B-05 (or approved equal).
11. Panel Certification: None
12. Incoming Power Voltage: 208 single phase
13. Incoming Power Surge Protection: Citel SD74U Line Surge Prospection.
14. Incoming Power Fuse Holder: Ferraz Shawmuk CMS221
15. Incoming Power Short Circuit Current Rating (SCCR): 10KA
16. Incoming Power Panel Surge Protection: Citel DS72RS-120 Din (or approved equal).
17. Variable Frequency Drive (VFD): Asea Brown Boveri (ABB) ACS580 (or approved equal).
18. Intrinsic Interface: Warrick Series 67 intrinsically safe multi-functional controller.

D. Field Devices

1. 24VDC Device Power Connection: Phoenix Contact "Trio Power".
2. Inline Insertion Flow Meter Controller: HACH sc200 (GLI)
3. Flowmeter Historical DataLogger: VersaLog-DCC-HR
4. Conductivity Liquid Sensors: GEMS SENSORS (or approved equal).

E. SCADA & Telemetry

1. Remote Terminal Unit (RTU): RedLion RAM 9931-VZ
2. Antenna: LTE 700-2800MHz

PART 3 - EXECUTION

3.1 EXISTING EQUIPMENT TESTING

- A. Check the conditions of all the existing equipment to remain in place including but not limited to wiring, cables, water level sensors, flow meters etc. Provide a written report on the condition of all existing equipment to remain.

3.2 COORDINATION

- A. Coordinate with other trades to the fullest extent possible.
- B. Provide an efficient, well-coordinated arrangement without conflict or sacrifice of design intent.

3.3 CONTROL PANEL FABRICATION

A. General

- 1. Fabricate panels per Shop level drawings.
- 2. Coordinate removing existing equipment from electrical cabinet scheduled to be removed. Preserve existing equipment, conduits and conductors from cabinet as needed.

B. Wiring

- 1. Pull new wiring from former cabinet (now a handhole) to new control panel location.
- 2. Power distribution wiring on line side of fuses in accordance with Division 16.
- 3. All wiring shall be clearly tagged and color-coded in accordance with NEC. All tag numbers and color-coding shall correspond to panel wiring diagrams prepared by Engineer. All power wiring, control wiring, grounding, and DC wiring shall utilize different color insulation for each wiring system used. Utilize the following color coding scheme.

C. Lightning/Surge Suppression

- 1. Provide to protect control panel and associated equipment from surges on incoming power circuits, or those induced by lightning strikes and propagated along signal or power lines connected to control panels. Surge protection: sized properly for intended purpose.
- 2. Maintain manufacturer recommended spacing around panel-mounted equipment.
 - a. ISA-RP60.3 Recommended Practice: used as a guide in layout and arrangement of panels and panel mounted components.

D. Nameplates

- 1. Furnish panels and panel devices with nameplates identifying panel and individual devices with the following.

3.4 INSTALLATION AND MOUNTING

1. Location of control panel shown on Drawings is approximate. Obtain information relevant to process control placement Work in the field. Exact location: approved by Owner or Engineer during construction. In case of interference with other Work, proceed as directed by Engineer.

3.4 STARTUP & COMMISSIONING

1. Power up Panel upon delivery to Owner.
2. Demonstrate the proper operation of all control and alarm functions to the Engineer and Owner.
3. Make all adjustments or repairs required to place the equipment in proper working order.

3.5 CLOSEOUT ACTIVITIES

1. Provide in accordance with Division 01 General Requirements.

END OF SECTION 33 1115