Project Manual and Specifications

Town of Sprague
Public Works Equipment
Storage Building

Prepared for the
Town of Sprague, Connecticut

Funded in Part by a Grant Through the
SMALL TOWN ECONOMIC ASSISTANCE PROGRAM

Constructed in Cooperation with the
State of Connecticut
Dannel P. Malloy, Governor

May 25, 2017

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INVITATION TO BID

Sealed bids for furnishing all labor, materials, tools, services and equipment necessary to complete the “Town of Sprague Public Works Equipment Storage Building” will be received at the office of the First Selectmen, Town Hall, 1 Main Street, Baltic, Connecticut 06330, until 10:00 AM on JUNE 22, 2017 at which time they will be publicly opened and read aloud. Bids received after the Bid Opening will be returned unopened.

The Project consists of the construction of a new public works storage building located on Baltic Reservoir Access Road in Sprague. The work described herein includes furnishing, installing and incorporating all materials and equipment into the project as well as performing or providing all labor, supervision, equipment and services unless otherwise noted within the bid documents.

The successful bidder will be required to furnish and pay for 100% Performance and Labor & Material Payment Bonds. The successful bidder must have the minimum insurance coverage stated within the bid documents under Bonding and Insurance Requirements. The State of Connecticut and the Town of Sprague shall be listed as an additional insured on all insurance certificates.

A satisfactory Bid Bond or Certified Check, in an amount equal to five percent (5%) of the base bid, shall be submitted with each bid. The Bid Bond shall be made payable to Town of Sprague and shall be properly executed by the Bidder and acceptable sureties. All bonds must be from sureties registered in the State of Connecticut. Contractors will also have to submit with the bid proposal all attachments stated within the bid documents under Required Documents – List of Bid Requirements.

Proposed forms of Contract Documents, including Plans and Specifications dated May 25, 2017, as prepared by CLA Engineers, Inc will be on file and available for review at the Sprague Town Hall, First Selectman’s Office, 1 Main Street, Baltic, Connecticut 06330, as of May 26, 2017.

A pre-bid conference to walk through the properties will begin at the project site on June 8, 2017, at 10:00 AM All prospective bidders are urged to attend.

Bid Documents are available digitally only and can be found on the Town of Sprague website: http://www.ctsprague.org. Neither the Owner nor Engineer will be responsible for full or partial sets of Bid Documents obtained from any other source.

Bids, to receive consideration, must be in the hands of the authorized representative no later than the day and hour mentioned above. No Bidder may withdraw their bid within 60 days after the actual date of bid opening thereof. Should there be reason why the contract cannot be awarded within the specific period, this time may be extended by mutual agreement between the Town and the designated, qualified low Bidder.

The Town reserves the right to accept or reject any or all options, bids or proposals, in whole or in part, to award any item, group of items, or total bid; to waive any informality in the bids or part thereof, and to accept any bid deemed to be in the best interest of the Town.

The Town is an Affirmative Action/Equal Opportunity Employer. Small/Minority/Women's Business Enterprises are encouraged to apply

Dated this 25th day of May 2017
First Selectman, Town of Sprague
REQUIRED DOCUMENTS – LIST OF BID REQUIREMENTS
REQUIRED DOCUMENTS - LIST OF BID REQUIREMENTS

Each bid package shall include one set of the following forms and documents:

- Bid Form
- Bid Bond
- Certification of Bidder Regarding Equal Employment Opportunity
- Proposed Subcontractors
- Proposed Suppliers
- Statement of Bidder’s Qualifications
- Certificate as to Corporate Principal
- Non-Discrimination in Employment
- Non-collusion Affidavit of Prime Bidder
- CHRO Contract Compliance Regulations Notification to Bidders
- Bidder Contract Compliance Reports
  - Part I – Bidder Information
  - Part II – Bidder Nondiscrimination Policies and Procedures
  - Part III – Bidder Subcontracting Practices
  - PART IV – Workforce Analysis
  - PART V – Bidder Hiring and Recruitment Practices
- Contractors Minority Business Enterprises Utilization Form
- Affidavit Minority Business Enterprises
- Certificate of Compliance with CT General Statute Sec 31-57b
- CT Dept. of Labor Contractor’s Wage Certification Form
- Contractor’s License
- Contractor’s Insurance Certificate

LIST OF REQUIRED DOCUMENTS AT CONTRACT SIGNING
Performance, Labor, and Materials Bonds

LIST OF REQUIRED DOCUMENTS PRIOR TO JOB COMPLETION
- Original Weekly Certified Payrolls from General Contractor and all Subcontractors
- Original Statement of Compliance submitted with each weekly Certified Payrolls
- “Completion document” (card, document, certificate or other written record issued by federal OSHA or by the Federal Mine Safety and Health Administration) as defined by Conn. State Agencies Regs. § 31-53b-1(2) must be attached to Certified Payroll
- Apprentice Certificates
- Subcontractor License(s), Apprentice Certificate(s) and Insurance Certificate(s)
- Lien Waivers from General Contractor, All Subcontractors and Major Suppliers
- Certificate of Substantial Completion
- As-built Drawings
- Certificate of Occupancy
- Contractor’s Affidavit of Payment of Debts and Claims AIA G706
- Contractor’s Affidavit of Release of liens AIA G706a
- Consent of Surety Company to Final Payment AG707

FIVE PERCENT (5%) RETAINAGE WILL NOT BE RELEASED UNTIL ALL REQUIRED DOCUMENTS ARE SUBMITTED
BONDING AND INSURANCE REQUIREMENTS
BONDING AND INSURANCE REQUIREMENTS

A local unit of government receiving a grant from the State of Connecticut which requires contracting for construction of facility improvement shall follow its own requirements relating to bid guarantees, performance bonds, and payment bonds, except for contracts or subcontracts exceeding $50,000.00. The State of Connecticut, CLA Engineers, Inc. and the Town of Sprague shall be listed as an additional insured. The "Hold Harmless" endorsement of the insurance shall include the interest of the municipality and the State of Connecticut. The Contractor and Subcontractors and other interests shall be so named. This policy shall insure against all risks of physical damaged except as modified by the Contract Documents and subject to the normal all risk exclusions.

a. A bid guarantee from each bidder equivalent to five percent (5%) of the bid price. The “bid guarantee” shall consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of his/her bid, execute such contractual documents as may be required within the time specified.

b. A performance bond on the part of the contractor for one hundred percent (100%) of the contract price. A “performance bond” is one executed in connection with a contract to secure fulfillment of all the contractor’s obligations under such contract.

c. A payment bond on the part of the contractor for one hundred percent (100%) of the contract price. A “payment bond” is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

d. Commercial General Liability. Including Contractual Liability Insurance, providing for a total limit of One Million Dollars ($1,000,000) for all damages arising out of bodily injuries to or death of all persons in any one accident or occurrence, and for all damages arising out of injury to or destruction of property in any one accident or occurrence, and subject to that limit per accident, a total (or aggregate) limit of Two Million Dollars ($2,000,000) for all damages arising out of bodily injuries to or death of all persons in all accidents or occurrences and out of injury to or destruction of property during the policy period.

e. Commercial Auto Liability. The operation of all motor vehicles, including those hired or borrowed, used in connection with this Agreement shall be covered by Automobile Liability Insurance providing for a total limit of One Million Dollars ($1,000,000) for all damages arising out of bodily injuries to or death of all persons in any one accident or occurrence, and for all damages arising out of injury to or destruction of property in any one accident or occurrence. In cases where an insurance policy shows an aggregate limit as part of the automobile liability coverage, the aggregate limit must be at least Two Million Dollars ($2,000,000).
f. **Contractor’s Protective Liability.** The contractor shall be covered under Contractor’s Protective Liability insurance with a minimum coverage amount of $1,000,000.

g. **Worker’s Compensation & Employer’s Liability.** (Note: when lead based and/or asbestos abatement work is undertaken, direct & indirect damages arising from these activities must be covered.) The contractor shall be covered under Worker’s Compensation & Employer’s Liability insurance with the following minimum coverage amounts: Bodily injury by accident, $1,000,000/accident; Bodily injury by disease, $1,000,000/employee; Bodily injury by disease, $1,000,000 policy limit or $100,000/$500,000/$100,000 when not involving hazardous material abatement.

h. **Certificates of Insurance for all subcontractors’ Workers Compensation & Employer’s Liability.** (Note: when lead based and/or asbestos abatement work is undertaken, direct & indirect damages arising from these activities must be covered.) The contractor shall provide certificates of insurance for Worker’s Compensation & Employer’s Liability insurance with the following minimum coverage amounts: Bodily injury by accident, $1,000,000/accident; Bodily injury by disease, $1,000,000/employee; Bodily injury by disease, $1,000,000 policy limit or $100,000/$500,000/$100,000 when not involving hazardous material abatement.
PROJECT SIGN
PROJECT SIGN

The contractor shall provide and prominently display the attached temporary construction sign on the job sight. The sign location shall be approved by the Owner prior to erection.
Town of Sprague
Public Works Equipment Storage Building

TOWN OF SPRAGUE

Constructed in cooperation with the

STATE OF CONNECTICUT
DANIEL P. MALLOY, GOVERNOR

Department of Economic and Community Development
Catherine H. Smith, Commissioner

and the
Town of Sprague
Catherine A. Osten, First Selectman

CLA Engineers, Inc. (Contractor)

SIGN PANEL: ¾” MDO-EXT-APA PLYWOOD SUPPORTED WITH (2) 4X4 TREATED WOOD COLUMNS AND SECURED 4’ INTO GRADE. TOP OF SIGN AT 8’-0” ABOVE GRADE.
COLORS: ALL LETTERS AND SYMBOLS ARE TO BE ROYAL BLUE. THE BACKGROUND WILL BE WHITE ENAMEL. BACK OF PLYWOOD AND SUPPORT STRUCTURE SHALL BE PAINTED MATTE BLACK.
TYPEFACE: HELVETICA MEDIUM
LOCATION: SIGN MUST BE LOCATED TO BE CLEARLY VISIBLE TO THE PUBLIC.
TIMING: INSTALL AT THE START OF CONSTRUCTION AND REMOVE AT CONSTRUCTION COMPLETION.
INFORMATION TO BIDDERS
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ARTICLE 1 RECEIPT AND OPENING OF BIDS

Sealed bids for the *Town of Sprague Public Works Equipment Storage Building* project will be received at the office of the First Selectmen, Town Hall, Sprague, Connecticut, at the time specified in the advertisement for bids, then publicly opened and read aloud.

The envelopes containing the bids must be sealed and designated as “*Town of Sprague Public Works Equipment Storage Building*”.

The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities in or reject any and all bids. Conditional or qualified bids will not be accepted. Any bid received after the time and date specified shall not be considered. Should there be reasons why the contract cannot be awarded within the specified period the time may be extended by mutual agreement between the Owner and the bidder.

ARTICLE 2 PREPARATION OF BID

Each Bid must be submitted on the prescribed form. All blank spaces for bid prices must be filled in, in ink or typewritten, both in words and figures. All bids must be prepared in conformity with and shall be based on and submitted subject to all requirements of the Specifications and Drawings together with all Addenda thereto.

ARTICLE 3 TELEGRAPHIC MODIFICATION

Any bidder may modify his bid by telegraphic communication at any time prior to the scheduled closing time for receipt of bids, provided such telegraphic communication is received by the Owner prior to the closing time, and provided further, the Owner is satisfied that a written confirmation of the telegraphic modification over the signature of the bidder was mailed and postmarked prior to the closing time. The telegraphic communication should not reveal the bid price but should provide the addition or subtraction or other modifications so that the final prices or items will not be known by the Owner until the sealed bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the telegraphic modifications.

ARTICLE 4 CORRECTIONS

Erasures or other changes in the bid must be explained or noted over the signature of the bidder.

ARTICLE 5 WITHDRAWAL OF BIDS

Bids may be withdrawn personally or on written or telegraphic request dispatched by the bidder in time for delivery in the normal course of business prior to the time fixed for the opening, provided that written confirmation of any telegraphic withdrawal over the signature of the bidder is placed in the mail and postmarked prior to the time set for the opening of the bids. Negligence
on the part of the bidder in preparing his bid confers no right of withdrawal or modification of his bid after such bid has been opened.

ARTICLE 6 QUALIFICATIONS OF THE BIDDER

The Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein. Conditional bids will not be accepted.

ARTICLE 7 OBLIGATIONS OF THE BIDDER

Bidders must satisfy themselves by personal examination at the site of the proposed work, by review of the Drawings and Specifications including Addenda, and by additional means as they may prefer, as to the actual conditions, requirements, and limits of the proposed work, and as to the accuracy of the information and statements herein contained, and the submission of any bid will be accepted by the Owner as satisfactory proof that the bidder has satisfied himself in these respects. The bidder shall not at any time after the submission of a bid dispute or complain of such statements or information, nor, assert that there was any misunderstanding in regard to the nature, or amount of work to be done. The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve the bidder of his obligation to furnish all materials except those materials furnished by the Owner and labor necessary to carry out the provisions of the Contract Documents and to complete the contemplated work for the considerations set forth in his bid, if his bid is accepted.

ARTICLE 8 CONDITIONS OF WORK

Insofar as possible, the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with traffic, with the use of existing facilities and utilities, with the use of municipally or State or privately owned lands, or with the work being performed by others. The Contractor must satisfy himself by his own investigation and research as to the nature and location of the work, the general and local conditions, including but not restricted to those bearing upon the transportation, disposal, handling and storage of materials, water, electric power, roads, means of access, the construction and making of connections of the work to existing facilities and utilities, or other similar conditions at the site, the character of equipment and facilities needed preliminary to and during the prosecution of the work, requirements of owners and controlling authorities having jurisdiction over the various lands, existing structures, facilities and utilities, and all other conditions affecting the work to be done and labor and materials needed.
ARTICLE 9 INFORMATION SUPPLIED TO BIDDERS

The Owner shall provide to bidders prior to bidding, all information which is pertinent to, and delineates and describes, the land owned and rights-of-way acquired or to be acquired.

The Contract Documents contain the provisions required for the construction of the project. Information obtained from any officer, agent, or employee of the Owner or any other person shall not affect the risks or obligations assumed by the Contractor or relieve him from fulfilling any of the conditions of the Contract.

ARTICLE 10 BID SECURITY

Each bid must be accompanied by a certified check of the bidder, or a bid bond prepared on the form of bid bond attached hereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner and from securities listed on the most recent IRS Circular 570, in the amount of 5 percent of the bid. Such checks or bid bonds will be returned to all but the three lowest bidders within five days after the opening of bids, and the remaining checks or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the contract; or if no award has been made within 60 days after the date of the opening of the bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid. The bid bond of the successful bidder will be retained until the payment bond and performance bond have been executed and approved, after which it will be returned.

ARTICLE 11 METHOD OF AWARD-LOWEST QUALIFIED BIDDER

If, at the time this Contract is to be awarded, the lowest base bid submitted by a responsible bidder does not exceed the amount of funds then estimated by the Owner as available to finance the Contract, the Contract will be awarded on the lowest base bid by a responsible bidder, availability of bidder and bidder considered best suited to the Owner's needs in the Owner's opinion. If such bid exceeds such amount, the Owner expressly reserves the right to increase or decrease any class, item, or part of the work, and this reservation includes the omission of any such item, items, class, or part of the work as may be decided by the Owner at unit prices submitted by the bidder to bring the Contract within available funds; or the Owner may reject all bids. In determining the lowest qualified bidder the total price bid for the Basic Contract will be used.

The term "lowest responsible bidder" shall mean the bidder whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work; who shall certify that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work.

The low bidder shall supply the names and addresses of major material suppliers and subcontractors when requested to do so by the Owner.
ARTICLE 12 EXECUTION OF THE AGREEMENT

A Contract in the form set forth hereinafter will be required to be executed by the successful bidder and the Owner. The attention of all bidders, therefore, is called to the form of the Agreement and the provisions thereof. The party to whom the Contract is awarded will be required to obtain the performance bond and payment bond and insurance certificates within ten (10) calendar days from the date when the Notice of Award is delivered to the bidder. The Notice of Award shall be accompanied by the necessary Agreement and bond forms. The Contractor shall furnish a performance bond and a payment bond, each in the amount of 100 percent of the Contract Price, with a corporate surety approved by the Owner, as security for faithful performance of the Contract.

The Bidder, ten (10) days after notification of award shall have three (3) copies of the Performance Bond, Payment bond, Insurance Certificates, Save harmless endorsement and Agreement ready for a contract signing with the Owner at the Owner's place of business, at which time a pre-construction conference shall be held.

ARTICLE 13 LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The successful bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within 5 days after he has received notice of the acceptance of his bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal the surety deposited with his bid.

ARTICLE 14 NOTICE TO PROCEED

The Notice to Proceed shall be issued within five (5) days of the execution of the Agreement by the Owner. Should there be reasons why the Notice to Proceed cannot be issued within such period; the time may be extended by mutual agreement between the Owner and Contractor.

ARTICLE 15 TIME OF COMPLETION AND LIQUIDATED DAMAGES

Time Completion
The bidder must agree to commence work on or before the date specified in the written Notice to Proceed of the Owner and to fully complete the total project within 150 consecutive calendar days thereafter.

Liquidated Damages
Contractor and Owner recognize that time is of the essence and that Owner will suffer financial loss if the Work is not completed within the times specified above, plus any extensions thereof allowed in accordance with the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner $300.00 for each day that expires after the time of completion stated above until the Work is substantially complete.
ARTICLE 16 POWER OF ATTORNEY

Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

ARTICLE 17 ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the Drawings, Specifications, or other pre-bid documents will be made to any bidder orally. Every request for such interpretation should be in writing, addressed to: CLA Engineers, Inc., 317 Main Street, Norwich, CT 06360. In order to be given consideration, such request must be made no later than June 15, 2017. Any and all interpretations and any supplemental instructions will be in the form of written Addenda to the Specifications, which, if issued, will be distributed to all prospective bidders, not later than three (3) days prior to the date fixed for the opening of bids in any one of the following methods:

1. Mailed by certified mail with return receipt requested; or
2. Faxed; or
3. Emailed

All Addenda so issued shall become a part of the Contract Documents.

ARTICLE 18 UNCERTAINTY OF QUANTITIES

The quantities listed in the bid (proposal) are approximate and are given only for use in comparing bids and to indicate approximately the total amount of the Contract; and the Owner does not expressly or by implication represent that the actual amounts of work will even approximately correspond therewith, but does call particular attention to the uncertainty of the quantities of the work involved which cannot be predicted in advance. The work under certain items may be materially greater or less than that given in the bid, as may be necessary in the judgment of the Owner to complete the work contemplated in the Contract.

Under the Contract, the Owner reserves the right to increase or decrease the approximate quantities for, or to omit entirely, any of the items as listed in the bid.

Only such quantities of the respective items of work actually performed and accepted will be paid for. An increase or decrease in the quantity for any item shall not be regarded as grounds for an increase or decrease in the bid prices.

ARTICLE 19 ITEMS NOT LISTED IN THE BID

Appurtenant items of work shown on the Drawings or specified or required to complete the work but not listed separately under the list of items in the bid shall be included in the cost of payment under the various applicable bid items of work and no separate payment will be made for such items. It shall be the responsibility of the Contractor to verify any missing or incomplete items.
ARTICLE 20 BALANCED BIDDING

Minus bidding on any item or items of the Specifications is prohibited. Bids should be made on each separate item of work shown in the bid (Proposal) with reasonable relation to the probable cost of doing the work included in such item and the right is reserved to reject wholly any bid in case any item or items thereof are obviously unbalanced or appear to the Owner to be so unbalanced as to affect or to be liable to affect adversely any interests of the Owner. The attention of the bidder is called to the fact that unbalancing of bids may adversely affect the Contractor if certain portions of the work are increased or decreased as provided in the Contract Documents.

ARTICLE 21 PRICES

Bidders shall state the proposed price for the work by which the bids will be compared. This price is to cover all the expenses incidental to the completion of the work in full conformity with the Contract, the Specifications, and the Drawings. The price or prices proposed shall be stated both in words and in figures, and any bid not so stated shall be rejected.

In the event there is a discrepancy between the unit prices and the extended totals, the unit prices shall govern. In the event that there is a discrepancy between the unit prices written in words and the unit prices written in figures, the unit prices written in words shall govern. No bid will be accepted which does not contain a unit or lump sum price for every item contained in the bid form.

ARTICLE 22 NONDISCRIMINATION

The Contractor agrees and warrants that in the performance of this contract he 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, sex, mental retardation or physical disability, including, but not limited to, blindness, unless it is shown by such contractor that such disability prevents performance of the work involved in any manner prohibited by the laws of the United States or of the State of Connecticut, and further agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission concerning the employment practices and procedures of the Contractor as relate to the provisions of this section.

ARTICLE 23 EMPLOYMENT OF LABOR

The wages paid to mechanics, laborers or workmen employed upon the work herein contracted to be done shall be at a rate equal to the rate of wages prevailing for the same work in the same trade or occupation in the SPRAGUE area as determined by the labor Commissioner of the State of Connecticut. See Section 31.53 of the General Statutes of the State of Connecticut, Revision of 1955, as amended.
Public Act 79-325 passes by the 1979 Legislature covers exemptions from Section 31.53 of the General Statutes. Under the new exemptions, effective October 1985, the regulations that the prevailing wage must be paid for work performed by contractors and subcontractors in connection with work on public facilities will not apply:

To public work alterations, repair, refinishing projects with total cost of less than $100,000.

To public works new construction with a total cost of less than $400,000.

All Bidders are informed that the project is considered as NEW work.

All Bidders are advised to inform themselves and to comply with the requirements of Federal, State and local laws governing the employment of labor.

The Contractor shall provide certified payroll sheets to the Owner which includes all employees involved with the project for each payroll period during the course of the project.

ARTICLE 24 LAWS AND REGULATIONS

The Bidder's attention is directed to the fact that all applicable federal and state laws and municipal ordinances for the construction, reconstruction, alteration, remodeling, repair or demolition of public works and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be seemed to be included in the Contract the same as though herein written out in full.

ARTICLE 25 PAYMENT FOR DRAWINGS AND SPECIFICATIONS

See Advertisement for Bids

ARTICLE 26 CONSTRUCTION SCHEDULE

Prior to start of work the Contractor will be required to submit a construction schedule showing the order in which he proposes to carry on the work, including dates at which he will start and finish various parts of the work conforming to major divisions of the specifications.

ARTICLE 27 TAXES

The Town of Sprague is considered exempt from the payment of Federal excise taxes, Connecticut Sales Taxes, etc. and such taxes shall be identified separately or excluded from the bid prices.

ARTICLE 28 NON-RESIDENT CONTRACTORS

Connecticut General Statute §12-430(7) requires that:
When a non-resident contractor enters into a contract they must post a 5% cash or guarantee bond for the total amount with the Commissioner of Revenue Services;

or

Any person dealing with a non-resident contractor without first obtaining a certificate of compliance must deduct 5% from the amount payable to the non-resident contractor and submit it to the state.

If the requirements are not met, the general contractor will be liable for all Connecticut taxes imposed.

All questions shall be directed to the State of Connecticut Department of Revenue Services Discovery Unit at 860-541-3280.

ARTICLE 29 OCCUPATIONAL SAFETY & HEALTH REGULATORY COMPLIANCE

Successful bidders must demonstrate compliance with the applicable safety and health acts including without limitation, 29CFR 1910.146 “Permit Required Confined Spaces”. “Sub-part P - Excavations” Part 1926 [Amended], Sections 1926.650, 651 and 652.

The contractor is responsible for ensuring OSHA compliance, and his responsibility includes supervising and monitoring work site conditions for OSHA compliance. If the contractor uses subcontractors the contractor is responsible for ensuring that the subcontractors fulfill their obligations with respect to employee safety, particularly including those which affect the entire site.

The Owner shall consider OSHA violations(s) over the past five years in determining the ability of the Contractor to comply with OSHA requirements and in determining whether contractor is a responsible bidder.

If there has been an OSHA violation within the past five (5) years (measured from the date of the bid), the contractor shall provide copies of the citation(s), all documents regarding final determination of such citations including settlement any explanation(s) of such violation(s).

ARTICLE 30 PROVISIONAL ITEMS

Provisional items are delineated in the bid form. Quantities for provisional items may or may not be used in whole or in part at the discretion of the Owner. This shall in no way affect the established contract unit prices. All bid unit prices for provisional items shall be added to establish the total bid amount.

ARTICLE 31 BORINGS AND SUBSURFACE DATA

Subsurface information is available for this Contract. The locations and logs of this information is shown on the Drawings.
Neither the OWNER nor the ENGINEER guarantees the accuracy of any subsurface information provided in the Contract Documents which the OWNER or others have obtained. The OWNER/ENGINEER do not make any representations as to the soil conditions, the kind or condition of the soil to be encountered in the prosecution of the work or the foundation materials to be encountered.

ARTICLE 32  CHRO REQUIREMENTS

a. The grantees and their contractors will need to comply with Sections 4a-60, 4-60a, 4a-60g, 46a-56, 46a-68b, 46a-68c, 46a-68d, 46a-68e and 46a-68f of the Connecticut General Statutes (C.G.S.) and Sections 46a-68j-21 through 43 of the Regulations of Connecticut State Agencies. The above statutes and regulations require the grantee to “aggressively solicit the participation of legitimate minority business enterprises as bidders, contractors, subcontractors and suppliers of materials.” on projects. Consult your Project Manager for assistance.

b. All bidders must complete, sign, and return the “CHRO Contract Compliance Regulations Notification to Bidders” form to the grantee at the time of bid opening. Bids not including this form should be considered incomplete and rejected. This form is attached, and can also be found at: [http://www.ct.gov/chro/lib/chro/pdf/notificationtobidders.pdf](http://www.ct.gov/chro/lib/chro/pdf/notificationtobidders.pdf)

c. For municipal public works contracts valued at over $50,000, state law requires the contractor, general contractor, or construction manager at risk to set a goal of twenty-five percent (25%) of the state-funded portion of the contract for award to eligible subcontractors holding current small business enterprise (SBE) certification from the DAS under the provisions of C.G.S. 4a-60g. Of the portion of contracts set aside for SBE’s, a goal of twenty-five percent (25%) (or 6.25% of the value of the entire contract funded by the state) must be set aside for awards to eligible contractors holding current minority business enterprise certification (i.e.: DAS certified Minority (“MBE”), Women (“WBE”) and/or Disabled (“DisBE”) owned businesses). The contractor, general contractor, construction manager at risk must make good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials on such projects.

d. For any municipal public works projects receiving between $50,000 and $500,000 in state funding, an Affirmative Action Plan or Set Aside plan must be filed with the Commission on Human Rights and Opportunities (CHRO) within 30 days following the contract award notice (Note: Please contact the Contract Compliance Unit at 860-541-4709 to determine which plan is required).

e. For any municipal public works projects receiving over $500,000.00 in state funding, regardless of the size of the contractor’s workforce, an Affirmative Action Plan or Set Aside plan must be filed within 30 days following the intent to award notice and must be approved by the CHRO prior to the award of the construction contract. The municipality
will need to contact CHRO if they choose to award the construction contract without an approved plan in place. The grantee will then need to retain 2% per month of the total contract value until the contractor has submitted an approved affirmative action plan to CHRO and CHRO has granted approval. (Note: Please contact the Contract Compliance Unit at 860 541-4709 to determine which plan is required).

f. Federal Financing (EDA, UD, CDBG, etc.) carries its own Minority/Women's contracting requirements. The DECD grantee must comply. The granting sources will provide instructions.

g. Please refer to pages 20-30 of this document which provide the grantee with the CHRO Contract Compliance Regulation Notification to Bidders Form, CHRO Bid Advertisement Language, Sample Municipal Checklist for CHRO Compliance, CHRO Notification of Contract Award, and Bidder Notification Letter Sample for Municipal Public Works Projects over $500,000.
BID PROPOSAL FORMS
BID FORM

TOWN OF SPRAGUE
PUBLIC WORKS EQUIPMENT STORAGE BUILDING

TO:    First Selectman
FROM: ______________
      Town of Sprague
      P.O. Box 677
      Sprague, CT 06330

The undersigned, having familiarized (himself, itself, themselves) with the existing conditions on
the Project Site affecting the cost of the work, and with the Contract Documents for the Town of
Sprague Public Works Equipment Storage Building hereby proposes to furnish all supervision,
technical personnel, labor, materials, equipment, tools, appurtenances, services, materials not
supplied by the Owner, and anything else necessary, including utility and transportation services
required to perform and complete this Contract, all in accordance with the Contract Documents,
at and for the unit prices for work in place for the following work items.

The quantity of the units shown below is given for the purpose of determining the Award. The Owner reserves the right to increase or decrease these quantities. Payment to the Contractor will be based on completed measured quantities of these work items.

Unit prices (if applicable) are to be written in both words and figures. In case of discrepancy, the unit price shown in words will govern.

BASE BID

ITEM     DESCRIPTION

1. **Equipment Storage Building:**
   All work shown on the Contract Drawings and included in the Technical Specifications including but not limited to:
   A. All work incidental to the construction and not specifically paid for under other items.
   B. Complete foundation, floors, and building.
   C. All interior utilities including mechanical, electrical, security and communication systems.
   D. Installation & maintenance of all erosion and sedimentation control measures.
   E. Maintenance and protection of traffic.
   F. All clearing, grubbing, demolition, and disposal.
   G. Construction stake-out and layout.
   H. Stripping and stockpiling of all topsoil for reuse on the site or reverse tilling the site to meet the proposed grades and requirements specified herein.
   I. Providing gravel fill or exporting material as needed for site work shown on the Contract Drawings.
   J. All underground utilities
   K. Fencing & Gates.
2. **Provisional Item – Rock Excavation & Disposal:**
All costs associated with removal & disposal of ledge rock and boulders in excess of 2 C.Y..

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock Excavation &amp; Disposal (Ledge &amp; Boulders in excess of 2 C.Y.)</td>
<td>20</td>
<td>C.Y.</td>
<td></td>
</tr>
</tbody>
</table>

UNIT PRICE IN WORDS: __________________________________________________________

3. **Provisional Item – Removal of unsuitable materials & replace with compacted structural fill:** All costs associated with removal & disposal of unsuitable materials and subsequent replacement with compacted structural fill.

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Fill Placement</td>
<td>100</td>
<td>C.Y.</td>
<td></td>
</tr>
</tbody>
</table>

UNIT PRICE IN WORDS: __________________________________________________________

**TOTAL BASE BID PRICE (SUM OF ALL PARTS):** ________________________________

**TOTAL BASE BID PRICE IN WORDS:** ______________________________________
ADD ALTERNATES

The undersigned bidder further proposes and agrees that, should the following alternate be accepted by the Owner, the amount of the Total Bid, as heretofore stated shall be adjusted by the amount of the selected Add Alternate(s).

Unit prices are to be written in both words and figures. In case of discrepancy, the unit price shown in words will govern.

This work shall include the following:

1. **Additional 6’ High Chain Link Fence:**
   All costs associated with installation of additional chain link fence as shown of the contract drawings.

   **LUMP SUM PRICE:** __________________________

   **LUMP SUM PRICE IN WORDS:** __________________________

The low bid will be determined by either of the following:

1. If the Owner elects to choose any of the Alternate items, then the low bidder will be established by adding the selected ALTERNATE AMOUNT from the BASE BID total amount.

2. If the Owner elects NOT to choose the ALTERNATE, then the low bidder will be established by the BASE BID amount only.

This contract is to be awarded to that responsible Bidder whose total bid is the lowest number of dollars for the above items.

If the Contractor should choose to employ manufacturers or suppliers other than those listed on the drawings and specifications, he shall submit a list of said suppliers as part of this proposal. If no list is included in the proposal, it shall be concluded by the Town that the Contractor will use only those suppliers listed on the drawings. An "or equal" supplier shall be included on the submitted list. Wherever in the plans and specifications, an item of equipment or material is designated by reference to a particular brand, manufacturer or trade name, it is understood that an equal product may be substituted by the bidder or Contractor, under the conditions as stated above.

The bidder must agree to commence work on or before a date to be specified in a written “Notice to Proceed” of the Municipality and to fully complete the project within 150 consecutive calendar days thereafter. The bidder must agree also to pay as liquidated damages, the sum of $300.00 for each consecutive calendar day thereafter as specified in the “Information to Bidders.”
The undersigned has checked carefully all the above figures and understands that the OWNER will not be responsible for any errors or omissions on the part of the undersigned in making up this bid.

The Bidder acknowledges the receipt of the following Addenda;

Addendum No. ________________, dated ________________________________

Addendum No. ________________, dated ________________________________

Addendum No. ________________, dated ________________________________

Enclosed is the Bidder’s Bond, Certified Check or Cashier’s Check No. ________ in the amount of five (5%) of the Bid.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The bidder agrees that this bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closing time for receiving bids.

Respectfully submitted:

By ________________________________

(Title)

________________________

(Business Address)

________________________

(Telephone Number)

________________________

(Email or Fax)

(SEAL - if bid is by a corporation)
BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned, ________________
______________, as PRINCIPAL, and ________________, as SURETY are held and firmly bound unto the Town of Sprague hereinafter called the "OWNER", in the penal sum of Five Percent of Total Bid Dollars, ($5% of Total Bid) lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these Presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the Accompanying Bid, dated ________________, 20__, for

TOWN OF SPRAGUE

PUBLIC WORKS EQUIPMENT STORAGE BUILDING

NOW, THEREFORE, if the Principal shall not withdraw said Bid within the period specified therein after the opening of the same, or, if no period be specified, within ninety (90) days after the said opening, and shall within the period specified therefore, or if no period be specified, within ten (10) days after the prescribed forms are presented to him for signature, enter into a written Contract with the Owner in accordance with the Bid, as accepted, and give bond with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such Contract; or in the event of the withdrawal of said Bid within the period specified, or the failure to enter into such Contract and give such bond within the time specified, the Principal shall pay the Owner the difference between the amount specified in said Bid and the Amount for which the Owner may procure the required work or supplies or both, if the latter be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.
IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals this ________ day of ________________, 20___, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body. In presence of:

(Individual Principal) (SEAL)

(Partnership) (SEAL)

Attest: By: ________________________________

______________________________

(Corporate Principal)

(Business Address) (SEAL)

Affix By: ________________ Corporate Seal

Attest:

______________________________

(Corporate Surety)

Affix By: ________________ Corporate Seal

Countersigned

by ________________________________

Attorney-in-Fact, State of ________________________________

(Power-of-Attorney for person signing for surety company must be attached to bond.)
CERTIFICATION OF BIDDER REGARDING
EQUAL EMPLOYMENT OPPORTUNITY

GENERAL

In accordance with Executive Order 11246 (30 F.R. 12319-25), the implementing rules and
regulations thereof, and orders of the Secretary of Labor, a Certification regarding Equal
Opportunity is required of bidders or prospective contractors and their proposed subcontractors
prior to the award of contracts or subcontracts.

CERTIFICATION OF BIDDER

Bidder’s Name: ____________________________________________________________

Address: __________________________________________________________________

Internal Revenue Service Employer Identification Number: _________________________

1. Participation in a previous contract or subcontract:
   A. Bidder has participated in a previous contract or subcontract subject to the Equal
      Opportunity Clause
      _____ Yes    _____ No
   B. Compliance reports were required to be filed in connection with such contract or
      subcontract
      _____ Yes    _____ No
   C. Bidder has filed all compliance reports required by Executive Orders 10925,
      11114, 11246, or by regulations of the Equal Employment Opportunity
      Commission issued pursuant to Title VII of the Civil Rights Act of 1964
      _____ Yes    _____ No
   D. If the answer to item C is “No”, please explain in detail on the reverse side of this
      certification.

2. Dollar Amount of Bid: $______________________________________________

3. Anticipated performance period: ____________________________ days.

4. Expected total number of employees who will perform the proposed construction:
   ________________________.
5. Non-segregated facilities

A. Notice to Prospective Federally-Assisted Construction Contractors

1. A certification of Non-segregated Facilities, as required by the May 9, 1967 order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted to the recipient prior to the award of a federally assisted construction contract exceeding $10,000, which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving Federally assisted construction contract awards exceeding $10,000, which are not exempt from the provisions of the Equal Opportunity clause will be required to provide for the forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause.

B. Notice to Prospective Subcontractors of Requirement of Certification of Non-segregated Facilities

1. A Certification of Non-segregated Facilities, as required by the May 9, 1967 order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $10,000, which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving subcontractor awards exceeding $10,000, which are not exempt from the provisions of the Equal Opportunity clause will be required to provide for the forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause.

C. Certification of Non-Segregated Facilities

The federally-assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor certifies further that he will not maintain or provide for any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term “segregated facilities,” means any waiting rooms, work areas, restrooms, and washrooms, restaurants and eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise.
The federally assisted construction contractor agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000, which is not exempt form the provisions of the Equal Opportunity Clause, and that he will retain duplicate of such certifications in his files. The contractor will include the original in his Bid Package.

6. Race or ethnic group designation of bidder. Check race or ethnic group on the appropriate line.

   ____Black  ____Spanish American  ____Oriental  ____American Indian  ____Aleut
   ____Eskimo  ____White (other than Spanish American)  ____Portuguese

Remarks:
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

**Certification:** The information above is true and complete to the best of my knowledge and belief.

__________________________________________________________________
Bidder’s Name and Title of Signer (please print)

_________________________    ________________________
Signature        Date

**Note:** The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001
PROPOSED SUBCONTRACTORS

THE BIDDER SHALL STATE THE NAMES OF ALL THE SUBCONTRACTORS THAT HE PROPOSES TO USE. ATTACH ADDITIONAL SHEETS IF NEEDED.

If none, write "None"

*Description of Work

Proposed Subcontractor, Name
Address

*Description of Work

Proposed Subcontractor, Name
Address

*Description of Work

Proposed Subcontractor, Name
Address

*Insert description of work and subcontractors' names as may be required.

This is to certify that all names of the above-mentioned subcontractors are submitted with full knowledge and consent of the respective parties.

The Bidder warrants that none of the proposed subcontractors have any conflict of interest as respects this contract.

Bidder ____________________________
(Fill in Name)

By ____________________________
(Signature and Title)
PROPOSED SUPPLIERS

THE BIDDER SHALL STATE THE NAMES OF PROPOSED MATERIAL SUPPLIERS FOR THE PROJECT. ATTACH ADDITIONAL SHEETS IF NEEDED.

If none, write "None" ________________________________

*Description of Material ________________________________

Proposed Supplier, Name ________________________________

Address ________________________________

*Description of Material ________________________________

Proposed Supplier, Name ________________________________

Address ________________________________

*Description of Material ________________________________

Proposed Supplier, Name ________________________________

Address ________________________________

*Insert description of work and suppliers names as may be required.

This is to certify that all names of the above-mentioned suppliers are submitted with full knowledge and consent of the respective parties.

The Bidder warrants that none of the proposed suppliers have any conflict of interest as respects this contract.

Bidder ________________________________

(Fill in Name)

By ________________________________

(Signature and Title)
STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

1. Name of Bidder.

2. Permanent main office address.

3. When organized.

4. If a corporation, where incorporated.

5. How many years have you been engaged in the contracting business under Your present firm or trade name?

6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate dates of completion.

7. General character of work performed by your company.

8. Have you ever failed to complete any work awarded to you? If so, where and why?

9. Have you ever defaulted on a contract? If so, where and why?

10. List the more important projects recently completed by your company, stating the approximate cost for each, and the month and year completed.

11. List your major equipment available for this contract.

12. Experience in construction work similar in importance to this project.

13. Background and experience of the principal members of your organization including the officers.

14. Will you, upon request, fill out a confidential detailed financial statement and furnish any other information that may be required by the OWNER?
15. The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner or representative in verification of the recitals comprising this Statement of Bidder's Qualifications.

Dated at ___________ this ________ day of __________________, 20__.

________________________________________
(Name of Bidder)

By ______________________________

Title ______________________________

State of ___________________________
) ss.

County of ___________________________

____________________________ being duly sworn deposes and says that he is __________ ________________ of __________________________) (name of organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me this ______ day of ________________, 20__.

________________________________________
Notary Public

My Commission expires ________________ 20 __.
CERTIFICATE AS TO CORPORATE PRINCIPAL

I, ______________________________, certify that I am the Secretary of the corporation named as Principal in the within bond; that ______________________________, who signed the said bond on behalf of the Principal was then ______________________________ of said corporation; that I know his signature, and his signature thereto is genuine; and that said bond was his duly signed, sealed, and attested to for and in behalf of said corporation by authority of this governing body.

(Corporate Seal)

________________________________________
Title: ________________________________
NONDISCRIMINATION IN EMPLOYMENT

State of ____________________________ )

County of ____________________________ ) ss

__________________________________, being first duly sworn, deposes and says that:

(1) He is (owner, partner, officer, representative, or agent), of ____________________________

__________, the bidder that has submitted the attached bid;

(2) Said bidder (has ______ ) (has not ________ ) previously performed work subject to the

President's Executive Order No. 11246, or any preceding similar Executive Order.

Signed ____________________________

__________________________________

Title

Subscribed and Sworn to before me

this ________ day of __________ 20 ___.

__________________________________

__________________________________

Title

My Commission expires ____________________, 20 __.
NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of __________________________)
County of __________________________

_________________________________________, being first duly sworn, deposes and says that:

(1) He is (owner, partner, officer, representative or agent) of __________________________
    __________, the Bidder that has submitted the attached bid;

(2) He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

(3) Such Bid is genuine and is not a collusive or sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from Bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other Bidder or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Owner or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(Signed) __________________________

__________________________________________ (Title)

Subscribed and sworn to before me
this ______ day of __________________________ 20 ___.

__________________________________________ (Title)

My Commission expires ____________________, 20 ___.
The contract to be awarded is subject to contract compliance requirements mandated by Sections 4a-60 and 4a-60a of the Connecticut General Statutes; and, when the awarding agency is the State, Sections 46a-71(d) and 46a-81(d) of the Connecticut General Statutes. There are Contract Compliance Regulations codified at Section 46a-68j-21 through 43 of the Regulations of Connecticut State Agencies, which establish a procedure for awarding all contracts covered by Sections 4a-60 and 46a-71(d) of the Connecticut General Statutes.

According to Section 46a-68j-30(9) of the Contract Compliance Regulations, every agency awarding a contract subject to the contract compliance requirements has an obligation to “aggressively solicit the participation of legitimate minority business enterprises as bidders, contractors, subcontractors and suppliers of materials.” “Minority business enterprise” is defined in Section 4a-60 of the Connecticut General Statutes as a business wherein fifty-one percent or more of the capital stock, or assets belong to a person or persons: “(1) Who are active in daily affairs of the enterprise; (2) who have the power to direct the management and policies of the enterprise; and (3) who are members of a minority, as such term is defined in subsection (a) of Section 32-9n.” “Minority” groups are defined in Section 32-9n of the Connecticut General Statutes as “(1) Black Americans...(2) Hispanic Americans...(3) persons who have origins in the Iberian Peninsula...(4) Women...(5) Asian Pacific Americans and Pacific Islanders; (6) American Indians...” An individual with a disability is also a minority business enterprise as provided by Section 4a-60g of the Connecticut General Statutes. The above definitions apply to the contract compliance requirements by virtue of Section 46a-68j-21(11) of the Contract Compliance Regulations.

The awarding agency will consider the following factors when reviewing the bidder’s qualifications under the contract compliance requirements:

(a) the bidder’s success in implementing an affirmative action plan;
(b) the bidder’s success in developing an apprenticeship program complying with Sections 46a-68-1 to 46a-68-17 of the Administrative Regulations of Connecticut State Agencies, inclusive;
(c) the bidder’s promise to develop and implement a successful affirmative action plan;
(d) the bidder’s submission of employment statistics contained in the “Employment Information Form”, indicating that the composition of its workforce is at or near parity when compared to the racial and sexual composition of the workforce in the relevant labor market area; and
(e) the bidder’s promise to set aside a portion of the contract for legitimate minority business enterprises. See section 46a-68j-30(10)(E) of the Contract Compliance Regulations.
INSTRUCTIONS AND OTHER INFORMATION

The following BIDDER CONTRACT COMPLIANCE MONITORING REPORT must be completed in full, signed, and submitted with the bid for this contract. The contract awarding agency and the Commission on Human Rights and Opportunities will use the information contained thereon to determine the bidders compliance to Sections 4a-60 and 4a-60a CONN. GEN. STAT., and Sections 46a-68j-23 of the Regulations of Connecticut State Agencies regarding equal employment opportunity, and the bidder’s good faith efforts to include minority business enterprises as subcontractors and suppliers for the work of the contract.

1) Definition of Small Contractor
Section 4a-60g CONN. GEN. STAT. Defines a small contractor as a company that has been doing business under the same management and control and has maintained its principal place of business in Connecticut for a one year period immediately prior to its application for certification under this section, had gross revenues not exceeding ten million dollars in the most recently completed fiscal year, and at least fifty-one percent of the ownership of which is held by a person or persons who are active in the daily affairs of the company, and have the power to direct the management and policies of the company, except that a nonprofit corporation shall be construed to be a small contractor if such nonprofit corporation meets the requirements of subparagraphs (A) and (B) of subdivision 4a-60g CONN. GEN. STAT.

2) Description of Job Categories (as used in Part IV Bidder Employment Information)
MANAGEMENT: Managers plan, organize, direct, and control the major functions of an organization through subordinates who are at the managerial or supervisory level. They make policy decisions and set objectives for the company or departments. They are not usually directly involved in production or providing services. Examples include top executives, public relations managers, managers of operations specialties (such as financial, human resources, or purchasing managers), and construction and engineering managers.

BUSINESS AND FINANCIAL OPERATIONS: These occupations include managers and professionals who work with the financial aspects of the business. These occupations include accountants and auditors, purchasing agents, management analysts, labor relations specialists, and budget, credit, and financial analysts.

MARKETING AND SALES: Occupations related to the act or process of buying and selling products and/or services such as sales engineer, retail sales workers and sales representatives including wholesale.

LEGAL OCCUPATIONS: In-House Counsel who is charged with providing legal advice and services in regards to legal issues that may arise during the course of standard business practices. This category also includes assistive legal occupations such as paralegals, legal assistants.

COMPUTER SPECIALISTS: Professionals responsible for the computer operations within a company are grouped in this category. Examples of job titles in this category include computer programmers, software engineers, database administrators, computer scientists, systems analysts, and computer support specialists.

ARCHITECTURE AND ENGINEERING: Occupations related to architecture, surveying, engineering, and drafting are included in this category. Some of the job titles in this category include electrical and electronic engineers, surveyors, architects, drafters, mechanical engineers, materials engineers, mapping technicians, and civil engineers.
OFFICE AND ADMINISTRATIVE SUPPORT: All clerical-type work is included in this category. These jobs involve the preparing, transcribing, and preserving of written communications and records; collecting accounts; gathering and distributing information; operating office machines and electronic data processing equipment; and distributing mail. Job titles listed in this category include telephone operators, bill and account collectors, customer service representatives, dispatchers, secretaries and administrative assistants, computer operators and clerks (such as payroll, shipping, stock, mail and file).

BUILDING AND GROUNDS CLEANING AND MAINTENANCE: This category includes occupations involving landscaping, housekeeping, and janitorial services. Job titles found in this category include supervisors of landscaping or housekeeping, janitors, maids, grounds maintenance workers, and pest control workers.

CONSTRUCTION AND EXTRACTION: This category includes construction trades and related occupations. Job titles found in this category include boilermakers, masons (all types), carpenters, construction laborers, electricians, plumbers (and related trades), roofers, sheet metal workers, elevator installers, hazardous materials removal workers, paperhangers, and painters. Paving, surfacing, and tamping equipment operators; drywall and ceiling tile installers; and carpet, floor and tile installers and finishers are also included in this category. First line supervisors, foremen, and helpers in these trades are also grouped in this category.

INSTALLATION, MAINTENANCE AND REPAIR: Occupations involving the installation, maintenance, and repair of equipment are included in this group. Examples of job titles found here are heating, ac, and refrigeration mechanics and installers; telecommunication line installers and repairers; heavy vehicle and mobile equipment service technicians and mechanics; small engine mechanics; security and fire alarm systems installers; electric/electronic repair, industrial, utility and transportation equipment; millwrights; riggers; and manufactured building and mobile home installers. First line supervisors, foremen, and helpers for these jobs are also included in the category.

MATERIAL MOVING WORKERS: The job titles included in this group are Crane and tower operators; dredge, excavating, and lading machine operators; hoist and winch operators; industrial truck and tractor operators; cleaners of vehicles and equipment; laborers and freight, stock, and material movers, hand; machine feeders and off bearers; packers and packagers, hand; pumping station operators; refuse and recyclable material collectors; and miscellaneous material moving workers.

PRODUCTION WORKERS: The job titles included in this category are chemical production machine setters, operators and tenders; crushing/grinding workers; cutting workers; inspectors, testers sorters, samplers, weighers; precious stone/metal workers; painting workers; cementing/gluing machine operators and tenders; etchers/engravers; molders, shapers and casters except for metal and plastic; and production workers.

Definition of Racial and Ethic Terms (as used in Part IV Bidder Employment Information)
White (not of Hispanic Origin) – All persons having origins in any of the original peoples of Europe, North Africa, or the Middle East. Black (not of Hispanic Origin) – All persons having origins in any of the Black racial groups of Africa. Hispanic – All persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race. Asian or Pacific Islander – All persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands. This area includes China, India, Japan, Korea, the Philippine Islands, and Samoa. American Indian or Alaskan Native – All persons having origins in any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.
BIDDER CONTRACT COMPLIANCE MONITORING REPORT
PART I – BIDDER INFORMATION

Company Name ________________________________________________

Street Address _______________________________________________

City & State _________________________________________________

Chief Executive _____________________________________________

Bidder Federal Employer Identification Number _______________________

Or Social Security Number _______________________________________

Major Business Activity (Brief description) __________________________

Bidder Identification (response optional/definitions on page 1)
- Bidder is a small contractor. Yes _______ No _______

- Bidder is a minority business enterprise. Yes _______ No _______

(If yes, check ownership category)
Black ______ Hispanic _____ Asian American _____ American Indian/Alaskan Native _____
Iberian Peninsula _____ Individual(s) with a Physical Disability _____ Female _____

Bidder Parent Company (If any)
- Bidder is certified as above by State of CT. Yes _______ No _______

Other Locations in CT ___________________________________________

(If any) – DAS Certification Number ________________________________
PART II – BIDDER NONDISCRIMINATION POLICIES AND PROCEDURES

1. Does your company have a written Affirmative Action/Equal Employment Opportunity statement posted on company bulletin boards? Yes _____ No _____

2. Does your company have the state-mandated sexual harassment prevention in the workplace policy posted on company bulletin boards? Yes _____ No _____

3. Do you notify all recruitment sources in writing of your company’s Affirmative Action/Equal Employment Opportunity employment policy? Yes _____ No _____

4. Do your company advertisements contain a written statement that you are an Affirmative Action/Equal Opportunity Employer? Yes _____ No _____

5. Do you notify the CT State Employment Service of all employment openings with your company? Yes _____ No _____

6. Does your company have a collective bargaining agreement with workers? Yes _____ No _____
   6a. If yes, do the collective bargaining agreements contain non-discrimination clauses covering all workers? Yes _____ No _____
   6b. Have you notified each union in writing of your commitments under the nondiscrimination requirements of contracts with the State of CT? Yes _____ No _____

7. Do all of your company contracts and purchase orders contain non-discrimination statements as required by Sections 4a-60 & 4a-60a Conn. Gen. Stat.? Yes _____ No _____

8. Do you, upon request, provide reasonable accommodation to employees, or applicants for employment, who have physical or mental disability? Yes _____ No _____

9. Does your company have a mandatory retirement age for all employees? Yes _____ No _____

10. If your company has 50 or more employees, have you provided at least two (2) hours of sexual harassment training to all of your supervisors? Yes _____ No _____ N/A _____

11. If your company has apprenticeship programs, do they meet the Affirmative Action/Equal Employment Opportunity requirements of the apprenticeship standards of the CT Dept. of Labor? Yes _____ No _____ N/A _____

12. Does your company have a written Affirmative Action Plan? Yes _____ No _____
    If no, please explain. ____________________________________________________________________________

13. Is there a person in your company who is responsible for equal employment opportunity? Yes _____ No _____
    If yes, give name and phone number. ____________________________________________________________________________
PART III – BIDDER SUBCONTRACTING PRACTICES

1. Will the work of this contract include subcontractors or suppliers? Yes _____ No _____
1a. If yes, please list all subcontractors and suppliers and report if they are a small contractor and/or a minority business enterprise (defined on page 1 / use additional sheet if necessary)

1b. Will the work of this contract require additional subcontractors or supplier other than those identified in 1a. above? Yes _____ No _____

PART IV – BIDDER EMPLOYMENT INFORMATION

<table>
<thead>
<tr>
<th>JOB Categories</th>
<th>OVERALL Totals</th>
<th>WHITE (Non-Hispanic)</th>
<th>BLACK (Non-Hispanic)</th>
<th>HISPANIC</th>
<th>ASIAN OR PACIFIC ISLANDER</th>
<th>AMERICAN INDIAN OR ALASKAN NATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male/Female</td>
<td>Male/Female</td>
<td>Male/Female</td>
<td>Male/Female</td>
<td>Male/Female</td>
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<tr>
<td>Management</td>
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<tr>
<td>Business &amp; Financial Ops</td>
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<tr>
<td>Marketing &amp;* Sales</td>
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<tr>
<td>Legal Occupations</td>
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<tr>
<td>Computer Specialist</td>
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<tr>
<td>Architecture/ Engineering</td>
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<tr>
<td>Office &amp; Admin Support</td>
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<tr>
<td>Bldg/Grounds/ Cleaning/ Maintenance</td>
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<td>Material Moving Workers</td>
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<tr>
<td>Production Occupations</td>
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<tr>
<td>TOTALS ABOVE</td>
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<tr>
<td>TOTALS ONE YEAR AGO</td>
<td></td>
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<tr>
<td>FORMAL ON THE JOB TRAINEES (ENTER FIGURES FOR THE SAME CATEGORY AS ARE SHOWN ABOVE)</td>
<td></td>
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</tr>
</tbody>
</table>

APPRENTICES
TRAINEE

*NOTE: JOB CATEGORIES CAN BE CHANGED OR ADDED TO (EX. SALES CAN BE ADDED OR REPLACE A CATEGORY NOT USED IN YOUR COMPANY)
PART V – BIDDER HIRING AND RECRUITMENT PRACTICES

1. Which of the following recruitment sources are used by you? (Check yes or no, and report percent used)

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>YES</th>
<th>NO</th>
<th>% of applicants provided by source</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Employment Service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Employment Agencies</td>
<td></td>
<td></td>
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<tr>
<td>Schools and Colleges</td>
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<tr>
<td>Newspaper Advertisement</td>
<td></td>
<td></td>
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<tr>
<td>Walk-Ins</td>
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<td></td>
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<tr>
<td>Present Employees</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Labor Organizations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minority/Community Organizations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (please identify)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Check (X) any of the below listed requirements that you use as a hiring qualification.

- Work Experience
- Ability to Speak or Write English
- Written Tests
- High School Diploma
- College Degree
- Union Membership
- Personal Recommendation
- Height or Weight
- Car Ownership
- Arrest Record
- Wage Garnishments

3. Describe below any other practices or actions that you take which show that you hire, train, and promote employees without discrimination

Certifications (Read this form and check your statements on it CAREFULLY before signing). I certify that the statements made by me on this BIDDER CONTRACT COMPLIANCE MONITORING REPORT are complete and true to the best of my knowledge and belief, and are made in good faith. I understand that if I knowingly make any misstatements of facts, I am subject to be declared in non-compliance with Section 4a-60, 4a-60a, and related sections of the CONN. GEN. STAT.

______________________________  ______________________________
Signature                        Title

______________________________  ______________________________
Date Signed                      Telephone
CONTRACTOR’S MINORITY BUSINESS ENTERPRISES
UTILIZATION FORM

NAME AND ADDRESS OF AWARDING AGENCY: NAME AND ADDRESS OF CONTRACTOR:

__________________________________________  ______________________________________

PROJECT NO.                                                                                      

__________________________________________  ______________________________________

DATE AWARDED                                                                                       

DATE BID OPENED                                                                                     

__________________________  ____________________________  ____________________________

NOTICE TO CONTRACTORS: Under Section 4-114a-5 of the Contract Compliance Regulations, contractors are required to make GOOD FAITH EFFORTS to employ Minority Business Enterprises (MBEs) as subcontractors and suppliers of materials on all projects subject to compliance requirements. The contract, which is referenced above, is subject to contract compliance requirements.

INSTRUCTIONS: List the name and addresses of all MBEs you have selected as subcontractors and suppliers of materials for this project. If the MBEs selected as subcontractors and suppliers of materials meet the criteria for MBEs set out in Section 4-114a of the Connecticut General Statutes, contractors MUST COMPLETE the attached affidavit. If such businesses are not currently registered with the Department of Administrative Services and if the contractor wishes the Commission on Human Rights and Opportunities (CHRP) to consider favorable the selection of the unregistered MBE in the evaluation of the contractor’s good faith efforts, contractors MUST complete the attached affidavit. In either case, the affidavit must be filled out in triplicate, with the original sent to the CHRO, Contract Compliance Unit, 90 Washington Street, Hartford, CT 06106; one copy sent to the Awarding Agency; one copy retained by contractor. If the Contractor does not wish the CHRO to consider selection of an unregistered MBE in its evaluation of the contractor’s good faith efforts, no affidavit need be made.

(Attach additional pages if necessary using same headings)

NAME AND ADDRESS OF MBE SUBCONTRACTOR(S) OR SUPPLIER(S) OF MATERIALS

__________________________  ____________________________  ____________________________

Check here if MBE(s) qualify under Section 4-114a of the C.G.S.

Check here if MBE is unregistered but wants to be considered for good faith efforts.

This form developed pursuant to Section 4-114a-5 of the Contract Compliance Regulations.
AFFIDAVIT

I, ____________________________, acting on behalf of __________________________, (Name of person signing certification) (Contractor)
of which I am the ____________________________, certify and affirm: (Title)

____  Check if provision applicable:

THAT the following Minority Business subcontractors and/or suppliers of materials that
________________________ has hired for Contract No. ____________________________
(Contractor)

with ____________________________, meet the criteria for Minority Business
(Awarding Agency)

Enterprises that qualify under current statutory requirements.

List of names of registered MBEs:

______________________________________________________________
______________________________________________________________
______________________________________________________________

____  Check if provision applicable:

THAT __________________________ has hired the following Minority Business subcontractors or
(Contractor)

suppliers of materials for Contract No. ____________________________ with ____________________________,
(Awarding Agency)

that are not registered with the Department of Administrative Services, but which should be
considered by the Connecticut Commission on Human Rights and Opportunities when evaluating the
________________________ good faith efforts:
(Contractor)

List of names of unregistered MBEs:

______________________________________________________________
______________________________________________________________
______________________________________________________________
I further certify and affirm that I have read and understand the contract compliance requirements codified at Section 4a-60 and Section 46a-71(d) of the Connecticut General Statutes.

I further certify and affirm that I have read and understand the Contract Compliance Regulations codified at Section 4a-60-1 and the following Regulations of Connecticut State Agencies.

I understand that false statements made herein are punishable at law.

________________________
(Name of Corporation or Firm)

________________________
(Signature and Title of Official Making the Affidavit)

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

________________________
Notary Public/Commissioner of Superior Court

My Commission Expires ____________________
CERTIFICATE

Of Compliance With

Connecticut General Statute Section 31-57b

I hereby certify that all of the statements herein contained below have been examined by me, and to the best of my knowledge and belief are true and correct.

The _______________________________ has / has not (circle one) been cited for three or more willful or serious violations of any occupational safety and health act or of any standard, order or regulation promulgated pursuant to such act, during the three year period preceding the bid, provided such violations were cited in accordance with the provisions of any state occupational safety and health act of 1970, and not abated within the time fixed by the citation and such citation has not been set aside following the appeal to the appropriate agency or court having jurisdiction or has / has not (circle one) received one or more criminal convictions related to the injury or death of any employee in the three year period preceding the bid.

The list of violations (if applicable) is attached.

Name of Firm, Organization or Corporation

Signed: 

Name

Seal

Title: 

Date: 

State of )

) ss: 

County of )

A.D., 20____

Sworn to and personally appeared before me for the above, ______________________________

_________________________, Signer and Sealer of the foregoing instrument and acknowledged the same to be the free act and deed of ______________________________, and his/her free act and deed as ______________________________.

My Commission expires: 

_________________________

Notary Public

Seal
Sec. 31-57b. Awarding of contracts to occupational safety and health law violators prohibited. No contract shall be awarded by the state or any of its political subdivisions to any person or firm or any firm, corporation, partnership or association in which such persons or firms have an interest (1) which has been cited for three or more willful or serious violations of any occupational safety and health act or of any standard, order or regulation promulgated pursuant to such act, during the three-year period preceding the bid, provided such violations were cited in accordance with the provisions of any state occupational safety and health act or the Occupational Safety and Health Act of 1970, and not abated within the time fixed by the citation and such citation has not been set aside following appeal to the appropriate agency or court having jurisdiction or (2) which has received one or more criminal convictions related to the injury or death of any employee in the three-year period preceding the bid. Any person who knowingly provides false information concerning the information required pursuant to this section shall be assessed a civil penalty of not less than five hundred dollars nor more than five thousand dollars and shall be disqualified from bidding on or participating in a contract with the state or any of its political subdivisions for five years from the date of the final determination that the information is false. Any political subdivision or any agency receiving false information pursuant to this section shall notify the Commissioner of Administrative Services and, upon receipt of such notice, the commissioner shall conduct a hearing in accordance with the provisions of chapter 54. Upon a determination that false information was provided, the commissioner shall impose a civil penalty in accordance with the provisions of this section. Such civil penalty shall be paid to the Treasurer or to an official of the political subdivision, as the case may be. Any civil penalty imposed pursuant to this section may be collected in a civil proceeding by any official of a political subdivision authorized to institute civil actions or, in the case of the state, by the attorney general, upon complaint of the Commissioner of Administrative Services.
GENERAL CONTRACTOR FINAL AFFIDAVIT WAIVER OF LIEN

Job Name: __________________________
State Of: __________________________
County Of: __________________________
Location: __________________________

To Whom It May Concern:

I. We the undersigned, being fully sworn and having entered into an agreement with __________________________ for __________________________
   Contracting agency work/materials
   on the construction of __________________________
on the premises of the Owner __________________________
at said project __________________________
state that all labor, material and services contracted for have been fully paid and indebtedness discharged to the date of this affidavit unless otherwise noted in section II of this document.

II. Furthermore, for and in consideration of $__________________ the undersigned does hereby waiver release and relinquish any and all claims of right of lien, which the undersigned may now have upon the premises above described for labor, materials and/or services.

III. Liability to the State of CT for sales and/or use tax, where applicable, has been discharged.

____________________________________
Firm’s Name

____________________________________
Authorized Signature

State of Connecticut: __________________________
County of: __________________________ Date: __________________________

Subscribed and sworn to before me, this _____ day of _________________, 20___.

____________________________________
Notary Public Signature
My Commission Expires: ______________________
SUBCONTRACTOR/SUPPLIER FINAL AFFIDAVIT WAIVER OF LIEN

To Whom It May Concern:

I. We the undersigned, been fully sworn and having entered into an agreement with ______________________ for ____________________________ subcontractor/supplier work/materials on the construction of __________________________________________ on the premises of the Owner __________________________________________ at said project __________________________________________, state that all labor, material and services contracted for have been fully paid and indebtedness discharged to the date of this affidavit unless otherwise noted in section II of this document.

II. Furthermore, for and in consideration of $ ____________ the undersigned does hereby waive release and relinquish any and all claims of right of lien, which the undersigned may now have upon the premises above described for labor, materials and/or services.

III. Liability to the State of CT for sales and/or use tax, where applicable, has been discharged.

____________________________________
Firm’s Name

____________________________________
Authorized Signature

State of Connecticut: ____________________________ Date: ____________________________

County of: ____________________________

Subscribed and sworn to before me, this _____ day of ____________________________, 20___.

____________________________________
Notary Public Signature
My Commission Expires: ____________________________
AGREEMENT AND BOND FORMS
AGREEMENT

THIS AGREEMENT, made this ___ th day of ________, by and between the Town of Sprague, hereinafter called “OWNER” and ________________________________

________________________________________________________

doing business as (an individual) or (a corporation) hereinafter called the “CONTRACTOR”.

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned;

1. The CONTRACTOR will commence and complete the **Town of Sprague Public Works Equipment Storage Building**.

2. The CONTRACTOR will furnish all of the material not supplied by Owner, supplies, tools, equipment, labor and other services necessary for the construction and completion of the PROJECT described herein.

3. The CONTRACTOR will commence the work required by the CONTRACT DOCUMENTS WITHIN 10 calendar days after the date of the NOTICE TO PROCEED and will complete the same within 150 consecutive calendar days unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS.

4. The CONTRACTOR agrees to perform all the work described in the CONTRACT DOCUMENTS and comply with the terms therein for the amount of $ ______________ _______________ as shown in the Bid schedule.

5. The CONTRACTOR agrees the sum of 5% of progress pay estimates will be retained until final acceptance of the PROJECT further the sum of 2% of the total PROJECT will be retained for a period of ninety days from final acceptance of the work.

6. The term “CONTRACT DOCUMENTS” means and includes the following:

   - Invitation to Bid
   - Information to Bidders
   - Bid Proposal
   - Bid Bond
   - Proposed Subcontractors
   - Proposed Suppliers
   - Statement of Bidders Qualifications
   - Certificate as to Corporate Principal
   - Nondiscrimination in Employment
   - Non-Collusion Affidavit of Prime Bidder
   - Contract Agreement
   - Form of Payment Bond
- Form of Performance Bond
- General Conditions
- Special Conditions
- Technical Specifications
- Drawings prepared by CLA Engineers, Inc.
- Specifications prepared by CLA Engineers, Inc.
- Addenda:
  No. __________, dated ____________________________
  No. __________, dated ____________________________
  No. __________, dated ____________________________
  No. __________, dated ____________________________

7. The OWNER will pay the CONTRACTOR in the manner and at such times as set forth in the General Conditions such amounts as required by the CONTRACT DOCUMENTS.

8. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns. IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in (3 copies) each which shall be deemed an original on the date first above written.

OWNER: __________________________   CORPORATE SEAL:

BY ____________________________ (Title)

ATTEST __________________________

CONTRACTOR: __________________________   CORPORATE SEAL:

BY ____________________________ (Title)

ATTEST __________________________
PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we ________________________________
(Name of Contractor)
_______________________ a ________________________________
(Corporation, Partnership, or Individual)
hereinafter called "Principal" and ________________________________
(Surety)
of, __________________________ State of ________________________________
(hereinafter called the
“Surety"), are held and firmly bound unto Town of Sprague, hereinafter called “Owner”,
(Owner)
in the penal sum of ____________________________________________ Dollars
($_________________________) in lawful money of the United States, for the payment made, we
bind ourselves, and successors, jointly presents of which sum well and truly to be our heirs,
executors, administrators and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered
into a certain contract with the Owner, dated the ________ day of ________________, 20__,
a copy of which is hereto attached and made a part hereof for the construction of:

________________________________________________________
TOWN OF SPRAGUE

________________________________________________________
PUBLIC WORKS EQUIPMENT STORAGE BUILDING

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties,
all the undertakings, covenants, terms, conditions, and agreements of said contract during the
original term thereof, and any extensions thereof which may be granted by the Owner, with or
without notice to the Surety, and if he shall satisfy all claims and demands incurred under such
contract, and shall fully indemnify and save harmless the Owner from all costs and damages
which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all
outlay and expense which the Owner may incur in making good any default, then this obligation
shall be void; otherwise to remain in full force and effect.

Town of Sprague
Public Works Equipment Storage Building

CLA Engineers, Inc.
Civil · Structural · Survey
PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder of the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work of to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary thereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in six (6) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20__.

ATTEST:

__________________________________________
(Principal) Secretary
(SEAL)

By ____________________ (s)

______________________________
(Address-Zip Code)

Witness as to Principal

______________________________
(Address-Zip Code)

Surety

ATTEST:

__________________________________________
(Surety) Secretary
(SEAL)

By ____________________ Attorney-in-Fact

______________________________
(Address-Zip Code)

Witness as to Surety

______________________________
(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is Partnership, all partners should execute bond.
PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we ______________________
 ______________________ a ______________________
(Corporation, Partnership, or Individual)
hereinafter called "Principal" and ______________________
(Surety)
of, ______________________ State of ______________________
hereinafter called the “Surety”, are held and firmly bound unto Town of Sprague hereinafter called “Owner”,
(Owner)
in the penal sum of ______________________ Dollars
($________________) in lawful money of the United States, for the payment made, we bind ourselves, and successors, jointly presents of which sum well and truly to be our heirs, executors, administrators and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain contract with the Owner, dated the _______ day of ____________, 20__, a copy of which is hereto attached and made a part hereof for the construction of:

____________________________
TOWN OF SPRAGUE

____________________________
PUBLIC WORKS EQUIPMENT STORAGE BUILDING

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.
PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder of the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work of to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in six (6) counterparts, each one of which shall be deemed an original, this the _____ day of ___________, 20__.

ATTEST:

________________________________________________________
By ________________________________ (s)
Principal

________________________________________________________
(Surety) Secretary
(SEAL)

________________________________________________________
Witness as to Surety

________________________________________________________
(Surety) Secretary
(SEAL)

________________________________________________________
Witness as to Surety

________________________________________________________
(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is Partnership, all partners should execute bond.
GENERAL CONDITIONS
INDEX TO GENERAL CONDITIONS

1. CONTRACT AND CONTRACT DOCUMENTS
2. DEFINITIONS
3. REPRESENTATIVES OF THE CONTRACTOR
4. CONTRACT SECURITY
5. CONTRACTOR'S OBLIGATIONS
6. SUPERINTENDENCE BY THE CONTRACTOR
7. CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES
8. USE OF PREMISES AND REMOVAL OF DEBRIS
9. GENERAL WARRANTY
10. PROTECTION OF WORK AND PROPERTY - EMERGENCY
11. WEATHER CONDITIONS
12. THE OWNER'S AUTHORITY
13. ALL WORK SUBJECT TO CONTROL BY THE OWNER
14. THE OWNER'S CONTROL NOT LIMITED
15. RIGHT OF THE OWNER TO TERMINATE THE CONTRACT
16. INTERPRETATION OF THE DRAWINGS AND SPECIFICATIONS
17. INSPECTION
18. REPORTS, RECORDS AND DATA
19. RIGHTS-OF-WAY AND SUSPENSION OF WORK
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ARTICLE 1 CONTRACT AND CONTRACT DOCUMENTS

The drawings, plans, specifications, and addenda enumerated in Article 1 of the General Conditions, Special Conditions, the Advertisement for Bid, the Information for Bidders, and the Bid Proposal as accepted by the OWNER, shall be binding upon the parties to this Agreement as if fully set forth therein. Whenever the term Contract Documents is used it shall mean and include the drawings, specifications and addenda. The OWNER shall interpret his own requirements. In case of conflict or inconsistency between the provisions of the signed portions of the Contract Documents and those of the specifications, the provisions of the signed portions shall govern.

ARTICLE 2 DEFINITIONS

The following terms as used in this contract are defined as follows:

A. **Owner** - The Owner of the project is the *Town of Sprague*.

B. **Contractor** - The term "Contractor" as hereinafter used shall refer to the General Contractor for this job.

C. **Owner's Representative** - The term "Owner's Representative" as hereinafter used shall refer to any engineer or inspector whom the Owner may designate to inspect, test or oversee the work herein specified.

D. **Contract** - Wherever the term "contract" is used in the General Conditions, it shall mean the actual bid form, specifications, Plans, General Conditions, Special Conditions and formal purchase order issued to successful bidder.

The rights and obligations of the CONTRACTOR under this contract shall include, but not be limited to the following:

ARTICLE 3 REPRESENTATIONS OF THE CONTRACTOR

The Contractor represents and warrants:

a. That he is financially solvent and that he is experienced and competent to perform the type of work required under this contract and that he is able to furnish the plant, materials, supplies, or equipment that may be necessary to perform the work as specified.

b. That he is familiar with all Federal, State and municipal laws, ordinances, orders, and regulations which may in any way effect the project work, or the employment of persons thereon, including but not limited to any special acts relating to the work or to the project of which it is a part.
c. That such temporary and permanent work required by the contract documents to be done by him will be satisfactorily constructed and can be used for the purpose for which it was intended and that such construction will not injure any person or damage property.

d. That he has carefully examined the drawings, specifications, and addenda, if any, and the site of the work and that from his own investigations, he has satisfied himself as to the nature and location of the work, the character of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items that may affect the work.

e. That he is aware of the hazards involved in the work and the danger to life and property both evident and inherent and that he will conduct the work in a careful and safe manner without-injury to persons or property.

ARTICLE 4 CONTRACT SECURITY

The Contractor shall furnish a Performance Bond and Payment Bond in amounts equal to at least one hundred percent (100%) of the contract price as security for the faithful performance of the Contract, and for the payment of all persons performing labor on the project under this contract and furnishing materials, equipment and all other incidentals in connection with this contract. The Surety on such a bond shall be from securities listed on the most recent IRS Circular 570, satisfactory to the Owner and the cost of the same shall be paid by the Contractor. prior to the starting of any work, the bonds must be approved by the Owner and be in the Owner’s hands. The bonds must be from a surety company licensed and approved to do business in the State of Connecticut.

ARTICLE 5 CONTRACTOR’S OBLIGATIONS

The Contractor shall perform all work in a good workmanlike manner, and in accordance with the plans and specifications and any supplements thereto, and according to any directions or orders given by the Owner unless otherwise stipulated. He shall furnish all supplies, materials, except those supplies and materials furnished by the Owner, facilities, equipment, tools and anything else necessary or proper to perform and complete the work required by this contract. He shall furnish, erect, maintain, and remove any construction plant or temporary work as may be required. He alone shall be responsible for the safety, efficiency-, and adequacy of his plant, appliances, and methods and for any damage which may result from their failure or their improper construction maintenance, or operation. The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements, and limitations of the contract and specifications and shall do, carry on, and complete the entire work to the satisfaction of the Owner.

The Contractor shall be solely responsible for all the work and shall provide all precautionary measures necessary for preventing injury to persons or damage to property. All injury or damage
of whatever nature resulting from the work or resulting to persons, property, or the work during its progress, from whatever cause, shall be the responsibility of the Contractor.

The Contractor shall hold the Owner and Engineer, or their duly authorized agents, harmless and defend and indemnify them against damages or claims for damages due to injuries to persons or property arising out of the execution of the project work, and for damages to materials furnished for the work, for infringement of inventions, patents, and patent rights used in doing the work, and for any act, omission, or instance of neglect by the Contractor, his agents, employees, or subcontractors.

The Contractor shall bear all losses resulting to him, including but not limited to losses sustained on account of the character, quality, or quantity of any part of the work, or all parts of the work, or because the nature of the conditions in or on the project site are different from what was estimated or indicted, or on account of the weather, elements, or other causes.

ARTICLE 6 SUPERINTENDENCE BY THE CONTRACTOR

The Contractor shall give the work the constant attention necessary to facilitate the progress thereof and shall cooperate with the Owner in every possible way.

At the site of the work, the Contractor shall, at all times, employ a suitably experienced construction superintendent who shall have full authority to act for the Contractor. It is understood that the employment of such representative shall be acceptable to the Owner and shall be such a person as can be continued in the capacity for the duration of the contract, unless he ceases to be on the Contractor's payroll.

ARTICLE 7 CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES

Within five (5) days after the date of "Notice to Proceed" the Contractor shall deliver to the Owner an estimated construction progress schedule in a form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the contract documents and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule. The Contractor shall also furnish the Owner: 1. a detailed estimate, giving a complete breakdown of the contract price; and 2. periodic itemized estimates of the work done for the purpose of making partial payments thereon.

ARTICLE 8 USE OF PREMISES AND REMOVAL OF DEBRIS

The Contractor undertakes, at his own expense:

a. To take every precaution against injuries to persons or damage to property.
b. To store his apparatus, materials, equipment, and supplies in such orderly fashion at the site of the work as will not unduly interfere with the progress of his work or any others.

c. To place upon the work or any part thereof, only such loads as are consistent with the safety of that portion of the work.

d. To clean frequently all refuse, scrap, and debris caused by his operations, and to dispose of same away from the site, so that the work site is maintained in a neat, workmanlike appearance.

e. To effect all cutting, fitting, or patching of his work required to make the same conform to the drawings and specifications, and except with the consent of the Owner, not to cut or otherwise alter the work of any other contractor.

f. Before final payment, to remove all surplus materials false work, temporary structures, including foundations thereof, plants of any description, and debris of any nature resulting from his operations and to dispose of same away from the site, so that the site is left in a neat, orderly, and workmanlike condition.

ARTICLE 9 GENERAL WARRANTY

Neither the final certificate of payment nor any provision in the contract documents nor partial or entire occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the contract documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty workmanship or materials.

The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which shall appear within a period of one year (1) from the date of final acceptance of the work, unless a longer period is specified by the Owner. The Owner will give final notice of observed defects with reasonable promptness.

ARTICLE 10 PROTECTION OF WORK AND PROPERTY - EMERGENCY

a. The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this contract. He shall at all times safely guard and protect his own work, and that of adjacent property, from damage. The Contractor shall replace or make good any such damage, loss, or injury at no additional expense to the Owner.

b. In case of an emergency which threatens loss or injury of property, and/or safety of life the Contractor will be allowed to act, without previous instructions from the Owner, in a diligent manner. He shall notify the Owner immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted to the Owner for approval.
c. Where the Contractor has not taken action but has notified the Owner of an emergency threatening injury to persons or damage to the work or to any adjoining property, he shall act as instructed or authorized by the Owner.

d. The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided elsewhere in the contract documents.

ARTICLE 11 WEATHER CONDITIONS

In the event of temporary suspension of the work or during inclement weather, or whenever the Owner shall direct, the Contractor shall, and shall cause his subcontractors to protect carefully his and their work and materials against damage or injury from the weather. If, in the opinion of the Owner, any work or materials are damaged or injured by reason of failure to protect them on the part of the Contractor, or any of his subcontractors, or otherwise damaged or injured by the Contractor's negligence, or are found to be defective, such materials or work shall be removed and replaced at the expense of the Contractor.

ARTICLE 12 THE OWNER'S AUTHORITY

The Owner shall give all orders and directions contemplated under this contract and specifications relative to the execution of the work. The Owner shall determine the amount, quality, acceptability, and fitness of the several kinds of work and materials which are to be paid for under this contract and shall decide all questions which may arise in relation to said work and the construction thereof. The Owner's estimates and decisions shall be final and conclusive, except as herein otherwise expressly provided. In case any question shall arise between the parties hereto relative to said contract or specifications, the determination or decision of the Owner shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected by such questions. The Owner shall decide 'the meaning and intent of any portion of the specifications and of any plans or drawings where the same may be found to be obscure or be in dispute. Any differences or conflicts in regard to their work which may arise between the Contractor and other contractors performing work for the Owner, shall be adjusted and determined by the Owner.

ARTICLE 13 ALL WORK SUBJECT TO CONTROL BY THE OWNER

a. In the performance of the work, the Contractor shall abide by all orders, directions, and requirements of the Owner, and shall perform all work to the satisfaction of the Owner, and at such times and places, by such methods, and in such manner and sequence as he may require. The Owner shall determine the amounts, quality, acceptability, and fitness of all parts of the work. The Owner shall interpret the drawings, specifications, contract documents, all other documents, and the extra work orders. The Owner shall also decide all other questions in connection with the work. The Contractor shall employ no plant, equipment, materials, methods or men to which the Owner objects and shall remove no plant, materials, or equipment or other
facilities from the work site without the Owner's permission. Upon request the Owner will confirm in writing any oral order, direction, requirement, or determination.

b. Inspectors shall be authorized to inspect all work done and materials furnished. Such inspection may extend to all parts of the work and to the preparation or manufacture of the materials to be used. The presence or absence of an inspector shall not relieve the Contractor from any requirements of the contract. In case of any dispute arising between the Contractor and the inspector as to materials furnished or the manner in which the work is being executed, the inspector shall have the authority to reject material or suspend work until the question has been decided by the Owner. The inspector shall not be authorized to revoke, alter, enlarge, relax, or release any requirement of these specifications, nor to approve or accept any portion of the work, nor to issue instructions contrary to the drawings and specifications. The inspector shall in no case act as foreman or perform other duties for the Contractor, or interfere with the management of the work by the latter. Any advice which the inspector may give the Contractor shall in no way be construed as binding the Owner, or the Engineers in any way, nor releasing the Contractor from the fulfillment of the terms of the contract.

ARTICLE 14 THE OWNER'S CONTROL NOT LIMITED

The enumeration in this contract of particular instances in which the opinion, judgment, discretion, or determination of the Owner shall control or in which work shall be performed to his satisfaction or subject to his approval or inspection, shall not imply that only matters similar to those enumerated shall be so governed and performed, but without exception all the work shall be so governed and performed.

ARTICLE 15 RIGHT OF THE OWNER TO TERMINATE THE CONTRACT

In the event that any of the provisions of this contract are violated by the Contractor, or any of his subcontractors, the Owner may serve written notice upon the Contractor and the Surety of its intention to terminate the contract, such notice to contain the reasons for such intention to terminate the contract. If within ten days (10) such violation or delay shall not cease and satisfactory arrangement of correction made, the contract shall, at the expiration of the ten days, cease and immediately serve notice thereof upon the Surety and the Contractor, and the Surety shall have the power to take over and perform the contract, provided, however, that if the Surety does not commence performing thereof within ten days (10) from the date of mailing to such Surety of Notice of termination, the Owner may take over the work and prosecute the same to completion by contract or force account at the expense of the Contractor, and the Contractor and his Surety shall be liable to the Owner for any excess cost occasioned the Owner thereby.

ARTICLE 16 INTERPRETATION OF THE DRAWINGS AND SPECIFICATIONS

Except for the Contractor's executed set, all drawings and specifications are the property of the Owner. The Owner will furnish the Contractor, without charge, three (3) sets of the drawings and
specifications. Additional sets will be furnished upon request, at actual cost of reproduction. Such drawings and specifications are not to be used on other work and those sets in usable condition shall be returned to the Owner upon request at the completion or cessation of the work or termination of the contract.

The Contractor shall keep one (1) copy of the drawings and specifications at the work site at all times and shall give the Owner and their representatives access thereto. Anything on the drawings and not mentioned in the specifications, or anything in the specifications that is not shown on the drawings shall have the same force and effect as if mentioned in both. In case of conflict or inconsistency between the drawings and the specifications, the specifications shall take precedence. Any discrepancy in the figures and the drawings shall be immediately submitted to the Owner for decision and the decision of the Owner shall be final. In case of differences between small and large scale drawings, the larger scale drawings shall take precedence.

ARTICLE 17 INSPECTION

The authorized representatives and agents of the Owner shall be permitted to inspect all work materials, payrolls, records of personnel, invoices for materials, and other relevant data and records.

ARTICLE 18 REPORTS, RECORDS AND DATA

The Contractor and each of his subcontractors, shall submit to the Owner such schedules of quantities, and costs, progress schedules, payrolls, reports, estimates, records, and other data as the Owner may request concerning the work performed or to be performed under this contract.

ARTICLE 19 RIGHTS-OF-WAY AND SUSPENSION OF WORK

Land and rights-of-way for the purpose of this contract shall be furnished by the Owner to the extent shown on the drawings; the Owner will use due diligence in acquiring said lands and rights-of-way as speedily as possible.

If however, lands or rights-of-way cannot be obtained before work on the project begins, the Contractor shall begin his work upon such land or rights-of-way as have been previously acquired by the Owner, and no claims for damages whatsoever will be allowed by reason of the delay in obtaining the remaining land and rights-of-way. Should the Owner be prevented or enjoined from proceeding with the work, or from authorizing its prosecution, either before or after the commencement by reason of litigation, or by reason of its inability to procure the lands or rights-of-way for the said work, the Contractor shall not be entitled to make or assert a claim for damages by reason of the said delay, or to withdraw from the contract except by consent of the Owner. Time for completion of work will be extended to such time as the Owner determines will compensate for the time lost by such delay, such determination to be set forth in writing.
ARTICLE 20 SUBCONTRACTORS

The Contractors may utilize the services of specialty subcontractors on those parts of the work which, under normal contracting practices, are performed by specialty subcontractors.

The Contractor shall not award work to any subcontractor other than those listed in his bid, without the prior written approval of the Owner, which approval will not be given until the Contractor submits a written statement concerning the proposed award to the subcontractor, which statement shall contain such information as the Owner may require.

The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work, to bind the subcontractors to the contract documents insofar as applicable to the subcontract work and to give the Contractor under any provisions of the contract documents.

Nothing contained in this contract shall create any contractual relationship between the Owner and any subcontractor.

ARTICLE 21 ASSIGNMENTS

The Contractor shall not assign the whole or any part of this contract or any monies due or to become due hereunder without the written consent of the Owner. In case the Contractor assigns all or part of any monies due or to become due under this contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the Contractor shall be subject to prior claims of all persons, firms, or corporations for services rendered or materials supplied for the performance of the work called for in this contract.

ARTICLE 22 MUTUAL RESPONSIBILITY OF CONTRACTORS

If, through acts of neglect on the part of the Contractor, any other contractor or any subcontractor shall suffer loss or damage to the work, the Contractor agrees to settle with such other contractor or subcontractor by agreement or arbitration. If such other contractor or subcontractor shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor who shall indemnify and save harmless the Owner against any such claim.

ARTICLE 23 SEPARATE CONTRACTS

The Owner reserves the right to let other contracts in connection with the construction of the contemplated work of the project, or contiguous projects of the Owner. The Contractor, therefore, will afford to any such other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, will properly connect and coordinate his work with theirs, and will not commit or permit any act which will interfere with the performance of their work.
The Contractor shall coordinate his operations with those of other contractors. Cooperation will be required in the arrangement for storage of materials and in the detailed execution of the work. Failure by the Contractor to keep informed on the progress of the work, or failure to give notice of the lack of progress or defective workmanship by others, shall be construed as acceptance by him of the status of the work as being satisfactory for proper coordination with and performance of his own work.

ARTICLE 24 SAFETY AND HEALTH REGULATIONS

These contract documents, and the joint and several phases of construction hereby contemplated, are to be governed, at all times, by the applicable provisions of the Federal law(s) including but not limited to the following:

1. Williams-Steiger Occupational Safety and Health Act, 1970, Public Law 92-596;


3. This project is subject to all of the Safety and Health Regulations (CFR 29, Part 1926 and all subsequent amendments) as promulgated by the U.S. Department of Labor on June 24, 1974.

In the event of any inconsistencies between the above laws and regulations and the provisions of these contract documents, the laws and regulations shall prevail.

ARTICLE 25 SHOP OR SETTING DRAWINGS

a. The Contractor shall submit promptly to the Owner six (6) copies of each shop or setting drawing prepared in accordance with a schedule predetermined by the Contractor. After examination of such drawings by the Owner, and the return thereof, if resubmission is required the Contractor shall make such corrections to the drawings as have been indicated and shall furnish the Owner with six (6) corrected copies. Regardless of corrections made in or approval given to such drawings by the Owner, the Contractor will, nevertheless, be responsible for the accuracy of such drawings and for their conformity to the drawings and specifications, unless he notifies the Owner in writing of any deviations at the time he furnishes the drawings.

b. Shop drawings of all fabricated work shall be submitted to the Owner for approval and no work shall be fabricated by the Contractor save at his own risk until approval has been given by the Owner.

c. The Contractor shall submit all shop and setting drawings on dates sufficiently in advance of requirements to enable the Owner ample time for reviewing the same, including time for correcting, resubmission and reviewing if necessary, and no claim for delay will be granted the Contractor by reason of his failure in this respect.
d. All shop drawings submitted must bear the stamp of the Contractor as evidence that the drawings have been checked by him. Any drawings submitted without this stamp of approval will not be considered and will be returned to the Contractor for resubmissions. If the shop drawings show deviations from the requirements of the contract documents because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal to the Owner, in order that if acceptable, suitable action may be taken for proper adjustment; otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the contract documents even though the shop drawings have been approved.

e. Where shop drawings are submitted by the Contractor that indicate a departure from the contract which the Owner deems to be a minor adjustment in his interest and not involving a change in the contract price or extension of time, the Owner may approve the drawings but the approval will contain in substance, the following:

"The modification shown on the attached drawings is approved in the interest of the Owner to effect an improvement for the project and is ordered with the understanding that it does not involve any change in the contract price or an extension of time; that it is subject generally to all contract stipulations and covenants; and that it is without prejudice to any rights of the Owner under the contract and bond or bonds."

f. The approval of the shop drawings will be general and shall not relieve the Contractor from the responsibility for adherence to the contract, nor shall it relieve him of the responsibility for any error which may exist.

g. The Contractor agrees to hold the Engineer and the Owner harmless and defend them against damages or claims for damages arising out of injury to others or property of third persons which result from errors on shop, working, or setting drawings whether or not they have been approved by the Engineer and/or the-Owner.

ARTICLE 26 ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

The Contractor will be furnished additional instructions and detail drawings as necessary to carry out the work included in the contract. The additional drawings and instructions thus supplied to the Contractor will coordinate with the contract documents and will be so prepared that they can be reasonably interpreted as part thereof. The Contractor shall carry out the work in accordance with the additional detail drawings and instructions. The Contractor and the Owner will prepare jointly a schedule fixing the respective dates for the submission of shop drawings, the beginning of manufacture, testing, and installation of materials, supplies, and equipment, and the completion of the various parts of the work; each schedule to be subject to change from time to time in accordance with the progress of the work.
ARTICLE 27 MATERIALS, SERVICES AND FACILITIES

It is understood that, except as otherwise specifically stated in the contract documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, superintendence, temporary construction of every nature, and all other services and facilities of every nature whatsoever, necessary to protect, execute, complete, and deliver the work within the specified time.

It is necessary for some work to be performed after regular hours, on Saturdays, Sundays, or legal holidays as designated by the Owner. Any work necessary to be performed after regular hours, on Saturdays, Sundays, or legal holidays shall be performed by the Contractor without additional expense to the Owner.

ARTICLE 28 CONTRACTOR'S TITLE TO MATERIALS

No material, supplies, or equipment for the work shall be purchased by the Contractor or any subcontractor, subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. The Contractor warrants good title to all material, supplies, and equipment installed or incorporated in the work and further warrants upon completion of all work, to deliver the premises, together with all improvements and appurtenances constructed or placed thereon by him, to the Owner free from any claims, liens, or charges, or encumbrances and further agrees that neither he nor any person, firm, or corporation furnishing any material or labor for any work covered by this contract shall have the right to a lien upon the premises or any improvement or appurtenance thereon.

ARTICLE 29 INSPECTION AND TESTING OF MATERIALS

All materials and equipment used in the construction of the project shall be new and of current manufacture. Testing will be done in accordance with accepted standards and as directed by the Owner; the laboratory or inspection agency shall be selected by the Owner. Except as specified elsewhere in these specifications, the Owner will pay for laboratory inspection.

All materials and workmanship shall be subject to inspection, examination, and testing by the Owner at any and all times during manufacture and/or construction and at any and all places where such manufacture and or construction is carried on, to establish conformance with these specifications and suitability for uses intended. Without additional charge the Contractor shall furnish promptly all reasonable facilities, labor, and materials necessary to make tests so required safe and convenient; he shall also furnish any mill, factory, or other such tests based on the Standards and Tentative Standards of the American Society for Testing Materials as required by the Owner.
ARTICLE 30 BRAND OR EQUAL CLAUSE

Recipients must incorporate in their specifications a clear and accurate description of the technical requirements for the material, product or service to be procured. Such description shall not, in competitive procurements, contain features which unduly restrict competition. The description shall include a statement of the qualitative nature of the material, product or service to be procured and, when necessary, shall set forth those minimum essential characteristics and standards to which it must conform if it is to satisfy its intended use. Detailed product specifications shall be avoided if at all possible when it is impractical or uneconomical to make a clear and accurate description of the technical requirements, a "brand name or equal" description approved by the Owner may be used as a means to define the performance or other salient requirements of a procurement. The specific features of the named brand which must be met by offerors shall be clearly stated.

ARTICLE 31 PATENTS

i. The Contractor shall hold and save the Owner harmless from liability of any nature or kind, including cost and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the contract, including its use by the Owner.

b. License and/or royalty fees for the use of a process which is authorized by the Owner must be reasonable, and paid to the holder of the patent, or his authorized agent, directly by the Contractor.

c. If the Contractor uses any design, device, or material covered by letters, patent, or copyright, he shall provide for such use by suitable agreement with the owner of such patent or copyrighted design, device, or material.

d. It is mutually agreed and understood that, without exception, the contract prices shall include all royalties, license fees or costs arising out of the use of such process, design, device or materials in any way involved in the work. The Contractor and/or his Surety shall indemnify and save the Engineer and the Owner harmless from all claims for infringement by reason of use of such patented material, device or design, in connection with the work under this contract, and shall indemnify the Engineer and the Owner for any cost, expense or damage which it may be obligated to pay for reason of such infringement at any time during the prosecution of the work.

ARTICLE 32 CONTRACTOR'S BOND AND INSURANCE

Each Bidder must be able to enter into contract, covering the work, within 10 days from the acceptance of his proposal.

The successful bidder must, within 10 days from the date of acceptance of his proposal, furnish and file with the Owner, a corporate performance bond and payment bond or equivalent security,
guaranteeing, completion of the job in accordance with the proposal. This bond or equivalent security shall be for 100% of the amount of the contract. The cost of a bond is to be figured as part of the cost of the job. The Surety Company must be one licensed to do business in the State of Connecticut, from securities listed on the most recent IRS Circular 570 and must be satisfactory to the Owner.

The successful bidder must, within 10 days from the date of acceptance of his proposal, file with the Owner, Workmen's Compensation, Comprehensive General Liability, Comprehensive Auto Liability, Certificates of Insurance satisfactory to the Owner, in compliance with the law, and in the following form and amount:

**Required bond and insurance coverage's and amounts are outlined in the Bonding and Insurance Requirements section of this Project Manual**

The Contractor shall purchase and maintain, until final payment, property insurance upon the Work at the site in an amount equal to the total bid price for the completed construction. This insurance shall include the interests of Owner, Contractor, Subcontractors, Engineer and Engineer's consultants in the Work, shall insure against the perils of fire and extended coverage, shall include “all risk” insurance for physical loss and damage including theft, vandalism, and malicious mischief, collapse and water damage, and shall include damages, losses and expenses rising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). This insurance shall be provided on the completed value form. If not covered under the “all risk” insurance or otherwise provided in these General Conditions, Contractor shall purchase and maintain similar property insurance on portion of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment.

**The Town of Sprague (Owner), the State of Connecticut and CLA Engineers, Inc. (Engineer) shall be named as additional insured on the above coverages.**

If subcontractors are employed, same limits as named above shall apply and the certificate of insurance must be filed with the Owner.

No contract shall be binding upon the Owner until such bond shall have been given and until Comprehensive General Liability, Comprehensive General Auto Liability and Workmen’s Compensation policy certificates indicated above have been filed with the Owner and approved as to form and sufficiency by the Owner. The insurance policy certificate provided by the successful bidder and all subcontractors—shall carry a statement by the insurance company that the Owner will receive at least ten (10) days notice prior to cancellation of any portion of the policies or any modifications in the insurance coverage that may affect the Owner's interest. The cost of all insurance coverage shall be included in the price of the contract cost.
The insurance company must be licensed to do business in the State of Connecticut and must be satisfactory to the Owner. THE OWNER, THE STATE OF CONNECTICUT AND CLA ENGINEERS, INC. MUST BE NAMED AS ADDITIONAL INSURED

ARTICLE 33 REPRESENTATIONS OF CONTRACTOR

The Contractor represents and warrants that he is financially solvent and that he is experienced and competent to perform the type of work outlined in the specifications and drawings and that he has carefully examined the drawings and specifications along with addendum (or addenda), if any, and the site of the work, and that from his own investigations, he has satisfied himself as to the nature and location of the work, the character, quality and quantity of surface and sub-surface materials likely to be encountered, the character of equipment and other facilities needed for the performance of the work, the general and local conditions and all other materials which may in any way affect the work or its performance and that he is aware of the hazards involved in the work and the danger to life and property both evident and inherent and that he will conduct the work in a careful and safe manner without injury to persons or property. He further warrants that any injury to persons or property resulting from the work shall be the sole responsibility of the Contractor.

ARTICLE 34 INDEMNITY OF OWNER BY CONTRACTOR

The Contractor shall indemnify and save harmless the Owner against any and all damages to property or injuries to or death of any person or persons, including property and employees or agents of the Owner, and shall defend, indemnify and save harmless the Owner from any and all claims, demands, suits, actions or proceedings of any kind or nature including workmen's compensation claims, of or by anyone whomsoever, in any way resulting from or arising out of the operations in connection herewith, including operations of subcontractors and acts or omissions of employees or agents of Contractor or his subcontractors. Insurance coverage specified herein and in any special conditions constitutes the minimum requirements and said requirements shall in no way lessen or limit the liability of Contractor under the terms of the contract. The Contractor shall procure and maintain, at his own cost and expense, any additional kinds and amounts of insurance which, in his own judgment, may be necessary for his proper protection in the prosecution of the work. The Contractor agrees to well and truly save and indemnify and keep harmless, the Owner against all liability, judgments, costs and expenses which may in any wise come against the Owner or which may in any wise result from carelessness, omission or neglect of the Contractor or his agents, employees or workmen in any way arising or resulting from the operation in connection herewith, including all liability to the Owner resulting from the failure to erect or maintain sufficient railing or fence as required by Section 13a111, Connecticut General Statutes, and against all liability from defects claimed to be in violation of Section 13a-149, Connecticut General Statutes. Any additional cost of this save harmless insurance coverage shall be included in the price of the contract.
ARTICLE 35 TERMINATION FOR CONVENIENCE

The Owner hereby reserves the right to terminate the performance of this contract for any reason the Owner deems appropriate. The Owner will pay all actual costs to date of termination, however, the Contractor shall not be entitled to any profit on furnished or unearned work.

ARTICLE 36 COMPETENT HELP TO BE EMPLOYED

The Contractor shall employ experienced foreman, craftsmen and other workmen competent in the work in which they are to be engaged. All work shall be accomplished by able, skilled and competent personnel. If any person employed on the work by the Contractor shall appear to be incompetent or unreliable in any way, he shall be discharged immediately upon the request of the Owner and shall not again be employed on the work.

ARTICLE 37 SPIRITUOUS LIQUORS AND DRUGS

The Contractor shall neither permit nor suffer the introduction or use of spirituous liquors upon the work embraced in this contract. Dope or drugs of any kind unless ordered by a physician are prohibited. Any employee found using spirituous liquors, dope or drugs of any kind unless ordered by a physician shall be immediately discharged.

ARTICLE 38 PROHIBITING EMPLOYEE DISCRIMINATION BY CONTRACTOR

The Contractor agrees and warrants that in the performance of this contract he will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religion, national origin, sex, or physical disability, including, but not limited to, blindness, unless it is shown by such Contractor that such disability prevents performance of the work involved in any manner prohibited by the laws of the United States or of the State of Connecticut, and further agrees to provide the commission on human rights and opportunities with such information requested by the commission concerning the employment practices and procedures of the Contractor as relate to the provisions of this section.

ARTICLE 39 CLAIMS FOR EXTRA WORK

After the contract has been signed, no claims for extra work will be honored unless authorized in writing by the Owner.

ARTICLE 40 WORK CHANGES

The Owner may make changes in the scope of the work required to be performed by the Contractor under the Contract by making additions thereto, or by omitting work therefrom, without invalidating the Contract, and without relieving or releasing the Contractor from any of his obligations under the Contract or any guarantee given by him pursuant to the Contract provisions, and without affecting the validity of the guaranty bonds, and without relieving or
releasing the surety or sureties of said bonds. All such work shall be executed under the terms of the original Contract unless it is expressly provided otherwise.

Except for the purpose of affording protection against any emergency endangering life or property, the Contractor shall make no change in the materials used or in the specified manner of constructing and/or installing the improvements or supply additional labor, services or materials beyond that actually required for the execution of the Contract, unless in pursuance of a written order from the owner authorizing the Contractor to proceed with the change. No claim for an adjustment of the Contract price will be valid unless so ordered. Upon request the Contractor shall supply the Owner with a detailed proposal for the changes showing quantities of, and unit prices for his work and that of any subcontractor involved. No such change order shall be considered, however, unless approved by the Owner and their duly authorized representatives prior to its issuance. Upon receipt of the written order the Contractor shall proceed with the work as and when directed. The amount of compensation to be paid to the Contract for extra or additional work so ordered shall be determined as follows:

(1) By such applicable Unit Price, if any, as set forth in the Agreement, or

(2) If no such Unit Prices are so set forth, or if the total net change increases or decreases the total Contract price more than 25 percent (25%) then by a Lump Sum mutually agreed upon by the Owner and the Contractor, and establish as follows:

For work to be performed under a Lump Sum agreement the Contractor may apply a 15% allowance for overhead and profit against the net cost of work actually to be performed by him except that in the event the change in work to be performed by him results in a net omission then no percentage for overhead and profit shall be allowed.

The Contractor is permitted a 5% allowance to be applied against the net cost to a subcontractor for work actually performed by the subcontractor, but on any change involving more than one subcontractor, their net costs and/or net omission shall be combined as one before consideration is given to the application of the 5% for the Contractor’s overhead and profit, and, in the event the Contractor shows a net omission for the changes as it affects the work actually to be performed by him, he is permitted only the 5% applied to the amount (if any) by which the net cost to the subcontractor exceeds the net omission by the Contractor.

For work to be performed by a subcontractor the cost to the Owner may include the net cost to the subcontractor plus an allowance of an amount not to exceed 15% of the net cost for the subcontractor’s overhead and profit, except that in the event that the change in work results in a net omission for the subcontractor there shall be no application of the 15% overhead and profit.

Net cost to the Contractor and/or subcontractor shall be that defined in sub-section (3) of this article, but in every case taxes imposed by law upon labor employed at the site shall be excluded; and all credits (which in the case of the Contractor shall include net omissions by the subcontractor) shall be deducted before the percentage can be applied.
For the purposes of applying the provisions of the article, the Owner will not recognize other than a direct subcontractor of the Contractor nor permit the aggregate allowance to exceed 20% as applied above, to the net cost of work performed by any subcontractor.

(3) If no such unit prices are set forth and if the parties cannot agree upon a lump sum, then the Owner may at his option either: 1) order the work to be done and compensated for in the following manner: by the actual net cost in money to the Contractor of the materials, the wages of applied labor, insurance, taxes imposed by law on labor employed on the work, plus such rental for equipment (other than tools) required and approved for such additional work. After excluding taxes imposed by law upon labor employed on the work, the Contractor shall receive 15% of the actual net cost outlined above as compensation for all other items of profit and costs or expenses including administration, overhead, superintendent, materials used in temporary structures, allowances (including provision for overhead and profit) made by the Contractor to subcontractors, additional premiums upon performance bond of the Contractor and the use of small tools; or (2) the Owner may order that item or portion of work omitted without invalidating any of the terms thereof, and there shall be deducted from the contract price the value as estimated by the Engineer of the labor and material omitted from the contract, if any be omitted.

ARTICLE 41 OWNER'S RIGHT TO DO WORK

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this contract, the Owner, after five (5) days written notice to the Contractor may, without prejudice to any other remedy he may have, make good such deficiencies and may deduct the cost thereof from the payment, then or thereafter due the Contractor.

ARTICLE 42 PAYMENTS

Payment for the work will be made when the work outlined in the specifications is completed or in accordance with the terms stated herein. Invoices shall be prepared in prescribed form by the Contractor and shall be submitted to the Owner's Superintendent in triplicate for checking and certifications.

No payment or compensation of any kind shall be made to the Contractor for damages because of hindrance or delay from any cause in the progress of work whether such hindrance or delays be avoidable or unavoidable.

ARTICLE 43 PAYMENT TO SUB-CONTRACTOR

The Owner assumes no obligation to pay to or to see to the payment of any sum to any sub-contractor.
ARTICLE 44 WORK IN INCLEMENT WEATHER

The Owner or the Owner's Superintendent will determine when conditions are unfavorable for work and may order the work or any portion of it suspended whenever, in his opinion the conditions are not such as will insure first class work. In general, work shall be prosecuted throughout the year and the Contractor will be expected to keep work going and employment of labor as continuous as possible. However, the Contractor shall, and shall cause his subcontractors to protect carefully his and their work against damage or injury from the weather. If this is not done to the Owner's satisfaction and any damage to the work occurs, the work shall be removed and replaced at the expense of the Contractor.

ARTICLE 45 ARCHEOLOGICAL FINDS

The Contractor, for the life of this contract, is herewith required to immediately notify the following organizations in the event that any articles such as "Charcoal", "bone", "shell", "cultural objects, fire cracked stones or stone flaking material" or any other such related items of historical significance are discovered:

    David Pourier
    Connecticut Historic Preservation Commission
    59 South Prospect Street
    Hartford, Connecticut 06106 (Tel. 566-3116)

and the resident engineer or inspector for the project.

ARTICLE 46 POWER AND WATER

Should the Contractor require electric power and/or water, he shall make necessary arrangements with the Owner for securing it and bear any expense involved, unless expressly provided for otherwise in the specifications.

ARTICLE 47 TOILET ACCOMMODATIONS

The Contractor shall provide necessary sanitary toilet accommodations for the workmen.

ARTICLE 48 LIENS

The final payment for the work will not be made until the Owner is satisfied that no liens have, or can be placed for material or labor on this work. If required by the Owner, waivers of liens may be required. If the Contractor, or any subcontractor refuses to furnish a release or waiver of liens, they may furnish a bond satisfactory to the Owner to indemnify the Owner against any liens.
ARTICLE 49 PROGRESS PAYMENTS

The CONTRACTOR may submit periodically, but not more than once each month, a Request for Payment for work done. The CONTRACTOR shall furnish the OWNER all reasonable facilities required for obtaining the necessary information relative to the progress and execution of the work.

Within fifteen (15) days of submission of any Request for Payment by the CONTRACTOR, the OWNER shall:

a. Approve the Request for Payment as submitted, or

b. Approve such other amount as he shall decide is due the CONTRACTOR, informing and CONTRACTOR in writing of his reasons for approving the amended amount, or

c. Withhold the Request for Payment, informing the CONTRACTOR in writing of his reasons for withholding it.

Within thirty (30) days from the date of approval of the Request for Payment the OWNER will:

a. Pay the Request for Payment as approved less a five percent (5%) retainage, until substantial completion of the project, at which time the retainage will be reduced to two percent (2%) until final completion.

b. Withhold payment in whole or in part on an approved Request for Payment to the extent necessary to protect himself from loss on account of any of the following causes discovered provided he informs the CONTRACTOR in writing of his reasons for withholding payment in whole or in part:

   1. Defective work.

   2. Evidence indicating the probable filing of claims by other parties against the CONTRACTOR.

   3. Failure of the CONTRACTOR to make payments to Subcontractors, material suppliers or labor.

   4. Damage to another Contractor.

ARTICLE 50 GENERAL GUARANTEE

The Contractor shall guarantee his work for a period of one (1) year after the date of the Owner's Superintendent's final inspection and acceptance as evidenced by final payment. he shall during that period repair promptly, at his own cost and expense all breaks, failures or defects which
develop in his work as a result of faulty material or workmanship. The performance bond shall remain in effect through the guarantee period.

**ARTICLE 51 FINAL INSPECTION AND ACCEPTANCE**

Upon receipt of written notice from the Contractor that his work is complete, the Owner's Superintendent will make a final inspection and will notify the Contractor of all instances in which the work fails to comply with the specifications as well as any defects which he may discover. The Contractor shall thereupon immediately rebuild, alter and restore the work so that it will comply with the specifications and he shall remedy any defects at his own cost and expense and to the satisfaction of the Owner's Superintendent. Upon the completion of such alterations or repairs the Owner's Superintendent will issue his certificate of final acceptance of work. The issuance of such certificate of final acceptance by the Owner's Superintendent shall not prevent the Owner from recovering damages at any subsequent time for work found to be actually defective.

**ARTICLE 52 FINAL PAYMENT**

The acceptance by the Contractor of payment for the final invoice, made after the Owner's Superintendent's certification of final acceptance as provided for in these General Conditions, shall release the Owner and every agent of the Owner from all further claims or liabilities to the Contractor of whatever nature, except for the remaining sum or sums of money withheld under the provisions of the contract.

**ARTICLE 53 CORRECTION OF FAULTY WORK AFTER FINAL PAYMENT**

The approval of the final Request for Payment by the Owner and the making of the final payment by the Owner to the Contractor shall NOT relieve and Contractor of the responsibility for faulty materials or workmanship. The Owner shall promptly give notice to faulty materials or workmanship and the Contractor shall promptly replace any such defects discovered within two years from the date of written acceptance of the work. The Owner shall decide all questions arising under this paragraph.

**ARTICLE 54 USE OF “HE”, “HIS” OR “HIM”**

Whenever in these specifications the masculine words, “he”, “his”, or “him” are used pertaining to the Contractor, Owner, Engineer or any other entity or person it shall be for brevity, and in no way is any sexual discrimination intended.
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ARTICLE 1 GENERAL

(a) The Owner and the Contractor agree that the following special conditions shall apply to the work to be performed under this Contract and that such provisions shall supersede any conflicting provisions of this Contract.

(b) The rights and remedies of the Owner provided for in these clauses are in addition to any other rights and remedies provided by law and under this Contract.

ARTICLE 2 CONTRACTOR TO CHECK DIMENSIONS AND SCHEDULES

The Contractor will be required to check all dimensions and quantities shown on the drawings or schedules given to him by the Owner, and shall notify the Owner of all errors therein which he may discover by examining and checking the same. The Contractor shall not take advantage of any error or omissions in these specifications, drawings, or schedules. The Owner will furnish all instructions should such error or omissions be discovered, and the Contractor shall carry out such instructions as if originally specified.

ARTICLE 3 PROTECTION OF TREES

The Contractor shall take special care to preserve and protect from injury all trees located along the lines of construction, and no such trees shall be cut down, trimmed, or otherwise cut without permission from the Owner.

ARTICLE 4 SEQUENCE OF THE WORK

The Contractor shall be required to prosecute his work in accordance with a schedule prepared by him in advance, in accordance with additional requirements specified herein and approved by the Owner. This scheduling shall state the methods and shall forecast the times of doing each portion of the work. Before beginning any portion of the work, the Contractor shall give the Owner advance notice and ample time for making necessary preparation.

ARTICLE 5 STREETS AND SIDEWALKS TO BE KEPT OPEN

The Contractor shall at all times keep the streets and highways in which he may be working open for pedestrian and vehicular traffic. If in the opinion of the Owner, the interest of abutters and the public requires it, the Contractor shall bridge or construct planking across trenches at street crossings and roads or private ways. The Contractor shall conduct his work in such a manner as the Owner may direct from time to time. No sidewalk shall be obstructed where it is possible to avoid it.

The Contractor shall provide all necessary fire crossings at principal intersections or ways usually traveled by fire apparatus with provisions for the apparatus so it can travel along the line of the pipe installations.
ARTICLE 6 LIGHTS, BARRIERS, WATCHMEN, AND INDEMNITY

The Contractor shall erect and maintain such barriers, lighting, warning lights, danger warning signals, and signs that will prevent accidents during the construction work and protect the work and insure the safety of personnel and the public at all times and places; the Contractor shall indemnify and protect the Owner and the Engineer in every respect from injury or damage whatsoever caused by any act of neglect by the contractor or his subcontractors, or their servants or agents, including any claims arising out of failure to erect and maintain sufficient railing or fence as required by Section 13A-111 Connecticut General Statutes from claims or defect in violation of 12A-14q Connecticut General Statutes.

The fact that the Department of Public Works may retain control of the premises, or that it or its agents may take action to erect or maintain railings or fences shall not relieve the Contractor's obligations hereunder.

In addition to the above, when and as necessary, or when required by the Owner, the Contractor shall post sign and employ watchmen or flagmen for the direction of traffic at the site and for excluding at all times unauthorized persons from the work site.

The Contractor shall be responsible for excluding at all times from the land within the easement areas, all persons not directly connected with the work.

ARTICLE 7 NIGHTWORK

Nightwork, or work on Saturdays, Sundays, or legal holidays requiring the presence of an engineer or inspector, will not be permitted except as designated by the Owner in case of an emergency. Should it be necessary for the Owner to operate an organization for continuous nightwork or for emergency nightwork, the lighting, safety and other facilities which are deemed necessary shall be provided by the Contractor. Compensation for this work shall be considered as having been included in the prices stipulated for the appropriate items of work as listed in the bid, and no extra compensation will be paid by the Owner.

ARTICLE 8 BUS LINE INTERFERENCE

Whenever it may be necessary to interfere with any bus lines, notice shall be given to the corporation owning the same, and reasonable time will be given to said corporation to arrange the schedule for operation of the bus line, as it may be necessary.

ARTICLE 9 DIFFERING SITE CONDITIONS

(a) The Contractor shall promptly and before such conditions are disturbed, notify the Owner in writing of: (1) sub-surface or latent physical conditions at the site differing materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this
contract. The Owner shall promptly investigate the conditions, and if he finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the contract modified in writing accordingly.

(b) No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required in (a) above; provided, however, the time prescribed therefore may be extended by the Owner.

(c) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract.

ARTICLE 10 DISPOSAL OF MATERIALS

The materials used in the construction of the work, shall be disposed away from the site in such manner so that will not endanger persons or the work, and so that free access may be had at any time to all hydrants and gates in the vicinity of the work. The materials shall be kept trimmed up so that as little inconvenience as possible to the public or adjoining tenants is caused.

ARTICLE 11 LENGTH OF TRENCH TO BE OPENED

The length of trench opened at any time from the point where ground is being broken to complete backfill and also the amount of space in the streets or public and private lands occupied by equipment or supplies, shall not exceed the length or space considered reasonably necessary and expedient by the Owner. In determining the length of the open trench or spaces for equipment, material, and supplies and other necessities, the Owner will consider the nature of the lands or streets where work is being done, types and methods of construction and equipment being used, inconvenience to the public or to private parties, possible dangers and other matters. All work must be constructed with a minimum of inconvenience and danger to all parties concerned.

Whenever the trench obstructs pedestrians and vehicular traffic, or any public or private property, the Contractor shall take such means as is necessary to maintain such traffic and access. Until such time as the work may have attained sufficient strength to support backfill, or if for any reason it is not expedient to backfill the trench immediately, the Contractor shall construct and maintain suitable plank crossings and bridge crossings to carry essential traffic in or to the street or property in question, as specified or directed.

Suitable lights, signs, and such required items to direct traffic shall be furnished and maintained by the Contractor.

The Contractor shall keep streets free from obstructions, debris, and all other materials. The Owner may, at any time, order the removal of any such material from the work area - and should the Contractor fail to do so within 24 hours after such notice of removal of the same, the Owner
may cause the material, debris, or other matter to be removed by some other such persons as he may employ, at the Contractor's expense. The cost thereof may be deducted from any payments due the Contractor under this contract. In special cases where public safety demands, the Owner may remove such materials without prior notice.

ARTICLE 12 INTERFERENCE WITH EXISTING STRUCTURES

Whenever it may be necessary to cross or interfere with existing culverts, drains, sewers, water pipes, fixtures, guardrails, fences, gas pipes, or other structures needing special care, due notice shall be given to the Owner, and the work shall be done according to his directions. Whenever required, all-objects shall be strengthened to meet any additional stress that the work herein specified may impose upon it, and any damage caused shall be thoroughly repaired. If so directed by the Owner, the location of any existing structure shall be changed to meet the requirements of the new work.

The Contractor shall be responsible for all broken mains or utilities encountered during the progress of the work and shall repair and be responsible for correcting all damages to the Owner. The Contractor shall contact the proper utility or authority to correct or make any changes due to utilities or other obstructions during the Project but the entire responsibility and expense shall be with the Contractor.

All damaged items of work or items required to be removed and replaced due to construction shall be replaced or repaired by the Contractor to the complete satisfaction of the property Owner and/or the Owner, and at no additional expense to the Owner.

ARTICLE 13 FINISHING AND CLEANING UP

In completing his operations, the Contractor shall immediately remove all surplus material, tools, and other property belonging to him, leaving the entire street or surroundings free and clean and in good order, at no additional expense to the Owner. The Contractor shall exercise special care in keeping the rights-of-way and private lands upon which work is performed free and clean of all debris, and shall remove all tools and other property when they are not in use.

ARTICLE 14 CLEAN UP AT THE CONTRACTOR’S EXPENSE

In case the Contractor fails or neglects to promptly remove all surplus materials, tools, and incidentals after backfilling, leaving the street or surrounding area clean and free of debris, and do the required repaving when ordered, the Owner may, after 24 hours notice, cause the work to be done and the cost thereof deducted from any payment due to the Contractor.

ARTICLE 15 RIGHTS OF ACCESS

Nothing herein contained or shown on the drawings shall be construed as giving the Contractor exclusive occupancy of the work area. The Owner or any other contractors employed by him, the various utility companies, - contractors or subcontractors employed by State or Federal agencies,
or any other agencies involved in the general project or upon public rights-of-way, may enter upon or cross the area of work or occupy portions of the area as is directed or necessary. When the territory of one contract is the convenient means of access to the other, the Contractor shall arrange his work in such a manner as to permit such access to the other and prevent unnecessary delay to the work as a whole.

ARTICLE 16 EXISTING UTILITIES OR CONNECTIONS

The location of existing underground pipes, conduits, and structures as shown has been collected from the best available sources and the Owner together with his agents, does not imply or guarantee the data and information in connection with underground pipes, conduits, structures, and such other parts, as to their completeness, nor their locations as indicated. The contractor shall assume that there are existing water, gas, and other utility connections to each and every building enroute, whether they appear on the drawings or not. Any expense and/or delay occasioned by utilities and structures or damage thereto, including those not shown, shall be the responsibility of the Contractor, at no additional expense to the Owner.

Before proceeding with construction operations, the Contractor shall make such supplemental investigations, including exploratory excavations by hand digging, as he deems necessary to uncover and determine the exact locations of utilities and structures and shall have no claims for damages due to encountering subsurface structures or utilities in locations other than those shown on the drawings, or which are made known to the Contractor prior to construction operations. The Contractor shall be responsible and liable for all damages to existing utilities and structures.

ARTICLE 17 PLANK CROSSINGS

As required or directed by the Owner, the Contractor shall install in selected locations suitable plank crossings, substantially built and reinforced to sustain vehicular traffic across excavations. No separate payment will be made for this work, the cost of which shall be included in the prices stipulated for the appropriate items in the work as listed in the bid.

ARTICLE 18 CLEANING FINISHED WORK

After the work is completed, the pipes, manholes, and structures shall be carefully cleaned free of debris and dirt, broken masonry, and mortar, and left in first class condition, ready to use. All temporary or excess materials shall be dispose of off-site and the work left broom clean, to the satisfaction of the Owner.

ARTICLE 19 DUST CONTROL

The Contractor shall exercise every precaution and means to prevent and control dust arising out of all construction operations from becoming a nuisance to abutting property owners or surrounding neighborhoods. Pavements adjoining the pipe trench shall be kept' broomed off and washed clean of excess materials wherever and whenever directed. Repeated daily dust control
treatment shall be provided to satisfactorily prevent the spread of dust until permanent pavement repairs are made and until earth stockpiles have been removed, and all construction operations that might cause dust have been completed. No extra payment will be made for dust control measures, compensation shall be considered to be included in the prices stipulated for the appropriate items as listed in the bid.

ARTICLE 20 FIRE PREVENTION AND PROTECTION

All State and municipal rules and regulations with respect to fire prevention, fire-resistant construction, and fire protection shall be strictly adhered to and all work and facilities necessary therefor shall be provided and maintained by the Contractor in an approved manner.

All fire protection equipment such as water tanks, hoses, pumps, extinguishers, and other materials, and apparatus, shall be provided for the protection of the contract work, temporary work, and adjacent property. Trained personnel experienced in the operation of all fire protection equipment and apparatus shall be available on the site whenever work is in progress, and at such other times as may be necessary for the safety of the public and the work.

ARTICLE 21 WORK BY OTHERS

The Owner reserves the right to do any other work which may be connected with, or become a part of, or be adjacent to the work embraced by this contract, at any time, by contract or otherwise. The Contractor shall not interfere with the work of such others as the Owner may employ, and shall execute his own work in such a manner as to aid in the execution of the work of others as may be required. No backfilling of trenches or excavations will be permitted until such work by the Owner is completed.

ARTICLE 22 FIRE AND POLICE NOTIFICATION

If it becomes necessary at any time to temporarily barricade a street or cause detours to be put up, or rerouting of traffic, the Fire and Police Departments, SEAT, Board of Education, and American Ambulance shall be notified by the Contractor, and their consent obtained before any such action is initiated.

ARTICLE 23 TEMPORARY POWER

The Contractor shall make all the necessary arrangements with the power company for providing temporary electric power for his use. All unauthorized sources of power, such as from neighboring homes, shall be prohibited.

ARTICLE 24 FAILURE TO REPAIR

Any emergency rising from the interruption of electric, gas, water, telephone, sewer and cable service due to the activities of the Contractor, shall be repaired by the Contractor as quickly as is possible.
If and when, in the opinion of the Owner, the Contractor is not initiating repair work as expeditiously as possible upon notification to do so, the Owner may, at his own option, make the necessary repairs using his own forces or those of others. The cost of such repairs shall be subtracted from the payments due to the Contractor.

ARTICLE 25 TRAFFIC CONTROL

A. The Contractor shall schedule and perform his work so as to cause minimum interference to traffic and to safeguard all highways and traffic therein, and to cause absolutely no interference to fire and emergency vehicles. Construction equipment and materials shall be located as to not endanger the work or obstruct traffic.

B. Every reasonable means shall be made to reduce, to a minimum, interference with and inconvenience to business concerns on account of the construction work.

C. The Contractor shall provide and maintain all signs, barricades, and traffic control equipment that may be required for the satisfactory performance of providing traffic control.

ARTICLE 26 CONTRACTOR TO LAY OUT HIS OWN WORK

The Owner will establish such general reference points as in his judgment will enable the Contractor to proceed with the work. The Contractor, at his own expense, shall provide all materials and equipment and such qualified helpers as the Owner may require for setting the general reference points and shall protect and preserve all stakes, benches, and other markers used to identify the reference points. The Contractor shall lay out all the Contract work from the above and shall be responsible for the accuracy of all lines, grades, and measurements. He will be required to employ at no extra expense to the Owner, a Connecticut registered land surveyor or registered professional engineer who shall perform all layout work for the construction of the Contract work, including all lines, grades, and measurements.

ARTICLE 27 - COOPERATION WITH UTILITIES

The Contractor shall coordinate his operations with the Owners of all underground or overhead utility lines within the project area.

The Contractor shall be liable for all damages or claims received or sustained by any persons, corporations or property in consequence of damage to the existing utilities, their appurtenances, or other facilities caused directly or indirectly by the operations of the Contractor.

ARTICLE 28 - WORK IN STATE HIGHWAY

Not Applicable
ARTICLE 29 - BLASTING

The approval of the Owner shall first be obtained before blasting is permitted. Before any explosive, such as dynamite or detonator caps are stored or used, the Contractor shall contact the Fire Department of the Town of Sprague for instructions relative to the regulations for possession and use of explosives in the Town of Sprague, Connecticut. The Contractor shall obtain all required permits, or licenses for possession and use of explosives to be used on the site or sites of construction.

The Contractor shall also be responsible for the explosive materials at all times; for the keeping of records regarding the explosives open at all times to inspection by the Police and Fire Departments of the Town of Sprague, Connecticut; for the storage of explosive materials in a secure manner away from all tools, overnight or for any length of time at the site or sites of construction; for the keeping of only such quantity of explosive material as may be needed for the work underway; for the immediate reporting to the Police and Fire Departments of the Town of Sprague, Connecticut of all unaccounted for explosive materials; for completely, adequately and carefully covering all blasts with suitable blasting mats in such a manner to prevent damage to landscape features, structures, facilities, privately owned and all other properties and surrounding objects and in a manner that will prevent injury to persons.

Unless specifically permitted, no blasting shall be done between the hours of sunset and sunrise on any day and no blasting will be allowed on Sundays or legal holidays. Receptacles especially constructed for use in the storage of explosives shall be provided for the storage of explosives and they shall be proof against bullets, fire or other conditions which might cause explosions of the contents. When the need for explosives is ended, all such materials remaining on the job shall be promptly removed from the premises.

ARTICLE 30 - EMERGENCY TELEPHONE NUMBER

The CONTRACTOR is required to provide the OWNER with a telephone number which can be used during emergencies, 24 hours per day, seven days per week, to reach the CONTRACTOR.
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SECTION 02000 - SITE GENERAL CONDITION

PART 1 - GENERAL

RELATED DOCUMENTS

The Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

DEFINITIONS

Form 816 refers to "State of Connecticut, Department of Transportation, State Highway Department, Standard Specifications for Roads, Bridges, and Incidental Construction - Form 816, 2004" and all supplements thereto. The word "Engineer" appearing in Form 816 shall be construed to mean Architect. Articles dealing with Method of Measurement and Basis of Payment are inapplicable to this Contract.

AASHTO means the latest standards and supplements thereto of the American Association of State Highway and Transportation Officials.

ASTM means the latest standards and supplements thereto of the American society of Testing and Materials.

ANSI means the latest standards and supplements thereto of the American National Standards Institute.

ENGINEER refers to the designated representative of the Owner.

ORDER OF CONSTRUCTION

Adapt all site work to the progress and order of construction of the work under this Contract. Carry out each section of work in such an order as the Engineer may direct.

Schedule work to install any sub-surface site work before beginning the sub-trades for Paved areas.

Submit schedule for review and acceptance by Engineer.

SPECIAL REQUIREMENTS

Verify and confirm all existing conditions and location of underground utilities in the field. No claim for extra compensation or for an extension of time will be allowed due to conditions inconsistent with the drawings and specification.
Restore any and all areas outside the contract limit lines that are disturbed during the progress of work as directed by the Engineer at the Contractor's expense.

Maintain existing roads passable for vehicles at all times. Access into the site is required by the Owner and shall be maintained by the Contractor.

Construction Phasing Diagrams: The Contractor will provide construction phasing diagrams for proper execution of sitework for approval by the Engineer. Contractor shall strictly follow the phasing diagrams.


Maintain access for fire fighting equipment to all parts of the site at all times.

Protect all streets, roads and sidewalks and maintain reasonably clear of dirt or other debris that is due to construction. Apply water as necessary for dust control.

Warning: Call 48 hours before any digging 1-800-922-4455.

Coordinate work with the other Contractors for the building construction. Cooperate with such Contractor to ensure the steady progress of all work.

Contractor to layout locations, lines, and grades of all site work using established permanent benchmarks. Maintain and protect established bounds and benchmarks and replace any which are destroyed or disturbed.

In the event the Owner, or the Owner and the Contractor jointly are required to obtain any permits the Contractor shall familiarize himself with the conditions of said permits and shall be held to comply with all requirements of the permits and all specifications attached thereto, as if the permits were held solely by the Contractor.

Whenever inspection, flagmen or other costs are incurred as a condition to the obtaining of permits, the Contractor shall be responsible for payment of said expenses. These costs shall be assumed to be included in the Contract unit prices.

EXAMINATION OF SITE

Data contained in Contract Documents (site survey, elevations, etc.) represents the best information available. There is no guarantee, implied or otherwise, as to the accuracy or completeness of the information shown. Contractor shall be constantly on the alert for
unknown, abandoned or mislocated utilities and for changing soil or subsurface water conditions.

Prior to start of any excavation, check with Owner and utility companies for location of underground facilities.

END OF SECTION
SECTION 02100 - SITE PREPARATION

PART 1 - GENERAL

RELATED DOCUMENTS

The Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

DESCRIPTION OF THE WORK

Site preparation shall include, but is not necessarily limited to the following:

Furnish and install siltation control.

Demolish specified existing improvements at site in accordance with the following:

Clear and grub all areas on which construction will occur.

Dispose of designated materials on site, in a legal manner, or remove materials off site.

RELATED WORK SPECIFIED ELSEWHERE

Section 02000: Site General Conditions

Section 02210: Site Earthwork

Section 02230: Utilities Excavation and Backfill

Section 02800: Site Improvements

Section 02900: Lawns

PART 2 - PRODUCTS

2.01 GENERAL

Filter Barrier:

Fabric sedimentation barrier of "Silt Fence with Belt" manufactured by Mirafi, Inc., P.O. Box 240967, Charlotte, North Carolina or equal approved by Architect.

Filter Fabric: M.08.01-26 of Form 816.
PART 3 - EXECUTION

SILTATION CONTROL

Before construction begins, install fabric sedimentation barrier, where shown on the drawings and as required by field conditions, or Local Authorities.


Conform to details on the drawings for fabric sedimentation barrier: use stakes supplied by the fence manufacturer; follow installation instructions.

Maintain by restaking, adjustment or replacement, as required. Remove excessive buildup of silt.

Remove and dispose of materials legally, off-site after site stabilization and no further chance for any erosion.

Siltation control to be maintained until final landscaping has been established.

See Section 02210 for "Definition of Rock" and rock excavation, and conform if applicable.

Prior to demolition, disconnect or notify appropriate utility companies to disconnect any active utility services. Cap any water lines. Plug any storm or sanitary lines. Work under the direction of the Architect.

Maintain barriers, fences, and lights as conditions require.

Dispose of material removed off-site in a legal manner.

CLEARING AND GRUBBING

Cut, grub, remove, and dispose of tree, roots, and rubbish as shown on the drawings.

Grub to a depth of 2 feet below any subgrade, and in all areas where Pavements or structures will be built.

Dispose of material removed off-site in a legal manner.

STRIPPING AND STOCKPILING TOPSOIL AND SUBSOIL
Before grading operations, grub out and strip any suitable topsoil, from disturbed areas within contract limit lines.

Stockpile on site only topsoil which conforms to Item M.13.01-1 of Form 816 and is free of subsoil. Screen topsoil prior to stockpiling to remove stones, earth clods, sticks, and roots over 1 inch, or other objectionable exteraneous matter or debris.

Ring stockpiles with hay bales.

END OF SECTION
SECTION 02210 - SITE EARTHWORK

PART 1 - GENERAL

RELATED DOCUMENTS

The Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

DESCRIPTION OF THE WORK

Site earthwork shall include, but is not necessarily limited to, the following:

Lay out and stake proposed work and set required elevations.

Excavate earth and rock (if encountered) necessary to establish the grades shown on the plans. Furnish additional fill if required.

Excavate earth and rock necessary to construct proposed building.

Trench excavation, bedding, and backfill necessary to install site utilities, structures, and improvements.

Remove excavated material unsuitable for fill or backfill and any excess material with legal disposal on site or offsite.

Provide, test, and place topsoil to complete the work of this Contract.

Construct processed aggregate bases for pavement.

Provide gravel subbases for pavements and gravel necessary to complete the work of other parts of this Specification.

Furnish and install 4” screened topsoil on all disturbed areas to be planted.

RELATED WORK SPECIFIED ELSEWHERE

Section 02000: Site General Conditions

Section 02210: Site Earthwork

Section 02230: Utilities Excavation and Backfill
Town of Sprague  
Public Works Equipment Storage Building  
Baltic Reservoir Access Road  
Sprague, Ct.

Section 02510:  Paving, Walks and Curbs

Section 02800:  Site Improvements

Section 02900:  Lawns

SUBMITTALS

Analysis from approved independent testing laboratory showing that bedding materials, processed aggregate, gravel and stone and aggregate materials comply with specified requirements.

Topsoil test results for approval prior to spreading.

Compaction test results.

DEFINITIONS

Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be at Contractor's expense.

Additional Excavation: When excavation has reached required subgrade elevations, notify Architect, who will make an inspection of conditions. If Architect determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Architect. The Contract Sum may be adjusted by an appropriate Contract Modification.

Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, drainage fill, or topsoil materials.

Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

Earth excavation shall include removal of all materials other than "rock".
Rock is defined as a boulder of 2 cubic yards or more in volume and rock in definite ledge formation, the removal of which requires the use of mechanical equipment. Rock removed by scarification or ripping method is considered as a separate classification.

Original grade is defined as being the grade which exists at the time of the Contract award.

Rough grade is defined as being the completed surface of required excavations greater than 13' in width.

Mass excavation is to be considered as an open area whose minimum horizontal dimensions exceed 13'.

Trench excavation is defined as the removal of material from areas 13 feet or less in its minimal horizontal dimensions and below the elevation of rough grade or original grade, whichever is lower.


**PROTECTION**

Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods necessary to prevent cave-in or loose soil from falling into excavation. Shoring and bracing shall be entirely independent of footings and foundations and shall not thrust against any portion of the structure.

Underpin adjacent structures that may be damaged by excavation work, including service utilities and pipe chases.

Notify Architect of unexpected subsurface conditions and discontinue effected work in area until condition is resolved.

Protect bottom of excavations and soil adjacent to and beneath foundations against freezing when atmospheric temperature is less than 35 degrees F.

Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water.

FIELD INSPECTION AND TESTING

The Contractor will retain and pay for an independent soils laboratory to perform inspection and testing of fill and other soil products as deemed necessary.

The Contractor shall notify the Owner and Architect when each layer of fill is to be in place and ready for testing. The Contractor shall allow ample time for testing.

If fill is placed in excess of 16" without testing, it shall be subject to removal on direction of Architect.

Work required to correct faulty operation shall be at the Contractor's expense. Retesting will be by the Contractor, and the Contractor shall pay costs.

Topsoil tests will be paid for by the Contractor.

PART 2 - PRODUCTS

PRODUCTS

FILL AND BORROW

Excavated materials only if they conform to Section 2.02.03-5 of Form 816.

Complete filling with "Borrow". Conform to "Borrow" Section 2.07.01 and 2.07.02 of Form 816.

Do not include any organic or perishable materials in fill or "borrow" material.

Dispose of unusable materials legally off site.

BACKFILL

Provide material free of organic or perishable material and without stones larger than 3 1/2 inches, with less than 10% by weight passing a No. 200 sieve. See attached Geotechnical Report for specific gradation.
Do not backfill with material which does not meet the above requirements. Furnish and satisfactorily place material conforming to "Borrow" Section 2.07.01 and 2.07.02 of Form 816.

TOPSOIL: M13.01-1 of Form 816.

SAND BEDDING: Sand or sandy soil, all of which passes a 3/8 inch sieve, and not more than 10% of which passes a No. 200 sieve. Existing material may be used if it complies.

STONE BEDDING: Item M.02.02-2 of Form 816. 3/4 inch size.

FILTER FABRIC: M.08.01-26 of Form 816.

PROCESSED AGGREGATE: Item M.05.01 of Form 816; except all stone where noted on the drawings.

GRAVEL: Item M.02.01 and requirements of material grading A as defined in M.02.06 of Form 816.

PART 3 - EXECUTION

ENGINEERING AND SURVEY WORK

Contractor to layout all work shown on drawings. Furnish all engineering services required. Provide a registered engineer or licensed surveyor to lay out the initial stakes. Maintain and protect or replace stakes as required. Stake the proposed entrance drives, parking areas, and set finish elevations. Tie in control points so as to permit any portion of the layout to be reestablished without a complete survey.

MASS EARTH EXCAVATION AND FILL

Provide excavation and filling, furnishing of additional fill if required, compaction, and the legal off-site disposal of all unsuitable sand, clay, unsuitable gravel, broken stone, limestone, soft shale, soft slate or sandstone, loose or decomposed rock boulders of less than 2 cubic yards in volume, and all other excavated material not otherwise classified under this Specification. Include rock or ledge of such consistency that is can be moved by bulldozer or other equipment.

Excavate and fill to the lines and grades indicated on the drawings and conduct the work so as to cause a minimum disturbance to adjacent areas. Do not fill when earth is frozen or in an extremely wet condition. Determine that areas to be filled are free of debris, refuse, and compressible or decomposable materials. Remove any topsoil and all organic material before placing fill.
Proof-roll all ground surfaces with a minimum of 2 passes of a compacting machine approved by the Architect. Remove any soft material unsuitable for supporting specified compacted fill and fill with specified fill material.

Notify the Architect when excavations are ready for inspection. Do not fill until conditions are approved.

Place in lifts 12 inches deep maximum after compaction and 8 inches deep maximum under pavements, structures, slabs, and footings.

Compact each lift to achieve the required percentage of Modified AASHTO laboratory density (ASTM D-1557, Method C.).

Compact fill to subgrade under proposed grass areas to 90% of density.

Compact fill to subgrade under pavements, structures, slabs, and footings to 95% of density.

Determine subgrades from the sections on the drawings. Provide topsoil under grass areas 4 inches minimum. Maintain finish grades as shown on the plans.

Maintain adequate site drainage at all times during grading operations.

TRENCH EARTH EXCAVATION AND BACKFILL

Excavate pipes 2 feet beyond the inside diameter. Excavate structures to the widths and depths shown on drawings or as specified. Keep sides as vertical as practical. Comply with State, town and local Water Company specifications for water.

Furnish all shoring and bracing necessary for the completion of the work. Keep excavations dry. Do not excavate to full depth in freezing temperature unless pipes, structures, and footings are installed immediately. Where accidental excavations cause material removal below the required grade for proposed pipes and structures, backfill with concrete up to the required grade.

Provide storm drainage and sanitary trenches with continuous slope in direction of flow.

Bedding shall be sand or sandy soil unless otherwise shown on the drawings. Install all pipes in bedding material with a thickness directly under the pipe of minimum 4 inches and preshaped to a height of 10% of total height of pipe for pipes 12 inches or larger and to 6 inches over pipe for smaller sizes. After pipe is installed, trench shall be backfilled with bedding material to a height of 25% of the total height of the pipe for storm sewers.
and to 6 inches over pipe for sanitary sewers and water. Backfill to subgrade, above bedding material, may be existing material provided that no unsuitable material, as determined by Architect, nor material with stones 3 1/2 inches or greater, be used.

Backfill in layers not exceeding 12 inches in depth. Conform to Section 2.05.03 of Form 816. Do not backfill against any pipe, structure or footing until permission is given by the Architect.

Compact to 95% Modified AASHTO laboratory density (ASTM D-1557, Method C.)

If pipes or structures are over fill areas, fill 12 inches higher than the top and compact to density required. Trench to required elevation. Extend fill and compaction at least 2 feet laterally on both sides or proposed pipe or structure.

EXCAVATION PROTECTION AND MAINTENANCE

Protect open excavations with fencing, warning lights, and/or other suitable safeguards.

Shore, sheet, or brace excavations and trenches as required to maintain them secure and to protect adjacent existing structures. Remove shoring as the backfilling progresses, but only when banks are safe against caving or collapse.

Provide, maintain, and operate pumps and related equipment, including stand-by equipment, of sufficient capacity to keep excavation free of water at all times, and under any and all contingencies that may arise until the structures attain their full strength. Notify the Architect and receive approval before discontinuance of pumping. Maintain ground water in bearing strata at a safe level at all times by methods which prevent loss of fines or other disturbances to the strata. If methods employed have not been adequate and the bearing value of the soil has been reduced, carry out remedial measures as directed by the Architect. Keep trenches free of water until trenches have been backfilled.

Dispose of water through temporary pipe lines with outfall to natural drainage courses. Prevent erosion of surrounding areas. Build temporary culverts if required. At completion of dewatering, remove temporary facilities and restore subgrade and any damaged areas.

MASS ROCK EXCAVATION

Remove and legally dispose of, off site, rock if encountered as defined below, in areas of cut and fill.

Definition of "Rock": All boulders measuring 2 cubic yards or more that require breaking for removal and all rock or stone that require break-up, prior to removal, when encountered within the limits of excavation.
Limits of Excavation:

Lawn Areas: 2 feet below elevations shown on the plans.

Pavements: Bottom elevation of the specified subbase course.

Mass rock excavation shall be measured in its original position by the cross section methods. Where such measurement is impractical, measure by such methods as the Architect directs. Payment will be only for excavation to the lines and grades indicated on the plans or as directed.

Mass rock will be paid for at the contract unit price per cubic yard of material.

TRENCH ROCK EXCAVATION

Remove and legally dispose of, off site, rock if encountered, as defined below when encountered.

All solid rock, pavements, or structures that require breaking by hand power tools (jack-hammers, etc.) prior to removal.

Boulders, pavements, or structures measuring 2 cubic yard or more that require breaking for removal.

Employ a satisfactory method in compliance with the general precautions described in 3.05(C).

Excavate rock within the following limits. No payment will be made for rock removal beyond these lines.

1 foot-0 inches beyond face of structures and footings, in a vertical a mane as is safe against collapse.

6 inches below bottom of structures and footings.

2 feet-0 inches beyond inside diameter of pipes in as vertical a plane as is safe against collapse.

1 foot-0 inches below bottom of inside barrel of pipes.

Method of Measurement and Payment: Same as Mass Rock Excavation.
TESTING AND SPREADING TOPSOIL

Test, screen, and spread topsoil on all disturbed areas within the contract limit line upon which construction does not occur.

At Contractor's expense, test representative samples of stockpiled topsoil and any borrow topsoil employing the services of a commercial or government agency approved by the Architect. Provide mechanical analysis and pH value. Topsoil shall conform to the requirements of Article M.13.01-1 of DOT Form 816.

Provide subgrade 6 inches below finish grade elevation for lawns. Loosen subgrade by disk ing or scarifying to a depth of 2 inches minimum where compaction has occurred. Clear surface of all stumps, stones, or roots 2 inches in diameter or greater; cable, wire, grade stakes, and any other materials which might hinder proper tillage or spreading. Obtain approval of the subgrade from the Architect before applying topsoil.

Spread topsoil uniformly to finish grades. Do not spread or work when topsoil or subgrade are frozen, muddy, or excessively dry. Place only when seeding and sodding operations can follow within a reasonable time.

Remove weeds above 1 inch in height prior to seeding and sodding operations. Do not allow weeds to go to seed. Keep heavy equipment, trucks, etc., off of topsoiled areas. If compaction occurs, scarify to a depth of 4 inches. Maintain finish grades by adding topsoil in eroded or settled areas.

PROCESSED AGGREGATE BASE

Furnish and install processed aggregate base under pavements to the depths shown on the drawings. Obtain approval of subbase by the Architect before placement.

Place and compact uniformly with a roller, vibratory compactor, or hand tamper, to 95% of Modified AASHTO laboratory density (ASTM D-1557, Method C.) to a tolerance of 3/4 inches in 10 feet.

Test by an independent testing laboratory approved by the Architect, in accordance with Section 02210 – Field Inspection and Testing

GRAVEL

Furnish and install gravel subbase under pavements and stone surfaces to the depths shown on the drawings and where noted or required in other parts of this Specification.
Prepare subgrade by removing all soft or spongy material and backfilling with specified material. Compact subgrade uniformly to 95% of Modified AASHTO laboratory density (ASTM D-1557, Method C).

Place gravel in maximum 12 inch layers and compact uniformly to 95% of Modified AASHTO laboratory density (ASTM D-1557, Method C).

Test by an independent testing laboratory approved by the Architect, in accordance with Section 02210- Field Inspection and Testing

END OF SECTION
SECTION 02230 - UTILITIES EXCAVATION AND BACKFILLING

PART 1 - GENERAL

REFERENCES

This Section covers the specification of excavation and backfilling work associated with Mechanical and Electrical work; examine all Contract Drawings and all other Sections of the Specifications for additional work related to this work.

Refer to the GENERAL CONDITIONS AND SUPPLEMENTARY CONDITIONS for other general requirements.

SCOPE

Provide labor, material, services, equipment and transportation necessary for excavation, backfilling and associated landscaping as indicated on Contract Drawings and specified herein, including but not limited to following:

Cutting of lawn, replacement topsoil and replacement sod.

Removal and replacement of ground cover plantings.

Excavation and backfill for sewer, water, electrical, mechanical, plumbing, lighting, telephone, and cable.

Exploration to find site obstructions.

While site plan shows items known to be on-site, other items without record may also exist. A careful location excavation process is required and will be enforced.

RELATED WORK UNDER OTHER SECTIONS

Related work specified in other Sections of the Specification includes, but is not limited to:

Concrete, concrete forms and reinforcing, except as specified herein.

Electric lines specified under SECTION 02740, MISCELLANEOUS SITE UTILITIES.

Electric conduit.

DEFINITIONS
The following terms are used in this Division and are defined as follows:

"Finished grades": required final grade elevations, matching adjacent existing trades.

"Invert" or "invert elevation": elevation at the base of the pipe at its inner surface or flow lines.

"Bottom of the pipe": elevation at the base of the pipe is its outer surface.

"Trench": excavation of any length in which the width is less than twice the depth. (Other excavation shall mean open excavation.)

**RECORD DRAWINGS**

Location, service, size and elevation of existing utilities uncovered shall be duly noted on record drawings, whether or not utilities are active, are part of construction, or are affected by construction.

Sufficient information shall be given so that invert elevations of all duct and pipe locations may be ascertained from these Records Drawings.

**EXAMINATION OF SITE**

Data contained in Contract Documents (site survey, elevations, etc.) represents the best information available. There is no guarantee, implied or otherwise, as to the accuracy or completeness of the information shown. Contractor shall be constantly on the alert for unknown, abandoned or mislocated utilities and for changing soil or sub-surface water conditions.

Prior to start of any excavation, check with Owner and utility companies for location of underground facilities.

**PART 2 - PRODUCTS**

**ORDINARY FILL**

Material indicated as "fill", "backfilling", or "rough grading" shall be a natural soil, well-graded; free from organic, weak, compressible, and frozen materials; containing no stone larger than 2" maximum dimension; free of expansive materials (such as high plastic clays) and of materials subject to decay, decomposition, or dissolution. Material shall be of nature and character such that is can be dried and compacted.
Fill shall be clean round aggregate with mix of particle sizes not less than 1/8" or more than 3/4" and shall not contain particles passing #8 sieve. Backfill materials shall meet ASTM C-33 paragraph 9.1 for quality and soundness.

If sufficient ordinary fill material is not available from excavations under the Contract, additional fill shall be brought to the site from other sources. Both material excavated from the site and material brought to the site, for use as ordinary fill, shall meet above requirements.

Ordinary fill shall be used for general grading; as backfill, except as otherwise specified herein; and as rough grading under gravel based for walks and paved areas.

PART 3 - EXECUTION

SERVICES AND UTILITIES

Inactive or abandoned utilities encountered during construction operations shall be removed, plugged or capped as required by the work.

Active utilities existing on the site shall be carefully protected from damage and relocated or removed as required by the work. Active utility lines damaged during construction shall be repaired or replaced as determined by Engineer, without additional cost to Owner.

COORDINATION

Coordinate work with that of other trades affecting, or affected by, work of this section. Cooperate with such trades to ensure the steady progress of all work.

Do NOT close or obstruct streets, sidewalks, alleys and passageways. Conduct operations so as to interfere as little as possible with normal use of roads, driveways, alleys, sidewalks, and other facilities adjacent to, or affected by, the work.

LAYOUT AND GRADES

Contractor to lay out lines and gradework on-site using established permanent benchmarks. Maintain and protect established bounds and benchmarks; as directed replace established bounds and benchmarks which are destroyed or disturbed.

DRAINAGE
Contractor shall assume responsibility for drainage of site and subsurface waters and shall maintain such drainage throughout Contract in a manner acceptable to Engineer, at all times protecting and maintaining existing conditions in adjacent areas.

Legally remove (by pumping, draining or bailing) water which may accumulate or be found on the site within the Contract limits, where excavation and grading area to be done.

Excavate and form pump wells, sumps, dams, flumes and other works necessary to keep trenches and excavations entirely clear of water.

Newly made and existing concrete and masonry shall be protected from injury resulting from dewatering work by the use of canvas or tar paper or by other sufficient method as accepted by Engineer.

Maintain sufficient and satisfactory pumping machinery. Provide pump wells, well points and underdrains as required to properly handle water.

Final trimming excavation shall NOT be done until Engineer has accepted the manner of dewatering.

Dispose of water from trenches and excavations properly: so as NOT to cause injury to public health, to public or private property, to existing work, to work completed or in progress, and to surface of roads, walks and streets; and so as NOT to cause any interference with use of roads, walks and streets. Effluents discharged into municipal sewers shall have acceptable ranges of temperature and pH.

Do NOT place concrete, pour fill, lay piping or install appurtenances in excavations containing free water. Keep utility trenches free from water until pipe joint material has hardened.

**FROST PROTECTION**

Do NOT excavate when freezing temperatures may be expected, unless footings or Slabs can be poured immediately after the excavation has been completed. Protect excavation from frost if placing of concrete is delayed.

**SHORING AND SHEETING**

Provide shoring, sheeting and bracing required at excavations, to ensure complete safety against collapse of earth at side of excavations.
Comply with federal, state and local safety regulations; comply with Associated General Contractors of America (AGCA) Manual of Accident Prevention in Construction.

Remove sheeting, shoring, etc., as backfilling operations progress, taking precautions necessary to prevent collapse of excavation sides.

**EXCAVATION**

Excavate as necessary for pipes, electrical lines and appurtenances. Unless otherwise indicated, provide separate trench for each utility.

If material at or below elevation of the bottom of the pipe or related structure is much, peat, peaty sand or other material unsuitable to support pipe or related structures: notify Engineer immediately and do not further trench excavation in this area until Engineer's instructions are received.

Except as noted on Drawings, width of pipe trench shall be an exceptable width.

Excavate rock and other hard material to at least 6" below pipe at all points. Refill such space and other cuts below grade with sand or fine gravel, 1/2" maximum, firmly compacted. Cut holes as necessary for joints and joint making.

Exercise extreme care during excavation to prevent damage to roots of trees. Excavation and grading within branch spread of trees shall be done by hand, in manner which will cause minimum damage to root systems, as accepted by Engineer. Open such trenches only when the utility can be installed immediately. Prune injured roots cleanly, and backfill as soon as possible.

Electric, Telephone Service, Cable and Propane Sleeves: Trenches shall be minimum 18" deep below finish grade to top of cable or conduit, unless noted otherwise, with spacing between conduit as required by Owner, local utility companies, and authorities having jurisdiction.

**PLACING AND COMPACTION OF FILL**

Surface of natural soil before fill is placed shall be NOT less than same density required for superimposed layers of fill. Compact natural soil as necessary to fulfill this requirement.

Fill shall be placed in horizontal layers of required depth before compaction. Each layer shall be spread evenly at right angles to previous layer and shall be thoroughly blade-mixed during spreading to insure uniformity of material in each layer. Engineer shall observe each layer before next layer is placed.
Do NOT place fill over frozen material. Fill shall NOT be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall NOT be resumed until moisture content and density of previously placed fill are as specified.

BACKFILLING UTILITIES AT BUILDING

From spaces to be backfilled, remove unsuitable material including all rubbish, organic materials, sheeting, bracing, forms and debris. Do NOT commence backfilling operations until conditions have been inspected and accepted by Engineer.

Do NOT place fill material against foundation walls or structural members unless they are either shored and braced or of sufficient strength to withstand the pressures to be imposed by compaction. Do NOT place fill until subgrade waterproofing materials have been in place for at least 48 hours, have been inspected and accepted by Engineer, and are properly protected.

Except for these restrictions, commence backfilling operations at earliest practical date. Backfilling shall be done in Owner's presence.

OTHER BACKFILLING

Do NOT commence backfilling operations until piping, conduit, tanks, etc., has been installed, tested and accepted by Engineer and locations of pipe, etc., have been recorded. Backfilling shall be done in Owner's presence.

Backfill over fuel piping: Backfill carefully by hand around pipe to depth of one foot above top of pipe, tamping firmly, in layers NOT EXCEEDING SIX INCH DEEP, compacting by hand tampers or mechanical tampers.

Backfill over tanks, electric utility trenches, and manholes shall be placed in 12" layers. Minimum 12" backfill material shall be provided between bottom of tank and concrete pad. Provide minimum 48" backfill over top of tank.

If manufacturer of utility line material suggests specific backfill materials and methods other than these specified herein, such requirements shall govern providing finished work equals or exceeds results obtainable by materials and methods specified herein.

GRADING

Do required grading including shaping, trimming, rolling and finishing of the surface of the subgrades for topsoil and paved surfaces.
If water pipe, sewer, conduit, drain, or other construction is damaged during grading work due to construction, Contractor shall repair such damage at no additional cost to Owner and shall restore such construction to its original condition.

Grading shall be brought to bottom of base course under paved areas, and to within six inches of finish grade under areas to receive topsoil.

Complete grading operations after building work is finished, utilities are installed, site improvements are constructed, and materials, rubbish and debris are removed from site. Leave subgrade for lawns clean, at required grades. Provide sufficient grade staking to witness correct lines and grades, as determined by Engineer.

Wherever streets, lawns, or sidewalks have been excavated as part of this Contract, provide materials necessary to bring finish surfaces level with existing adjacent surfaces. Such work shall be installed to match existing conditions in accordance with regulations or authorities having jurisdiction. Notify proper authorities prior to restoring surfaces outside Contract Limits.

END OF SECTION
SECTION 02800 - SITE IMPROVEMENTS

PART 1 - GENERAL

RELATED DOCUMENTS

The Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

DESCRIPTION OF THE WORK

Site improvements shall include, but is not necessarily limited to the following:

Chain Link Fence

Gates

Bollards.

Miscellaneous cast-in-place concrete.

RELATED WORK SPECIFIED ELSEWHERE

Section 02000: Site General Conditions

Section 02210: Site Earthwork

EXISTING CONDITIONS

Beginning work means acceptance of existing conditions.

SUBMITTALS

Traffic Signs: Shop drawings and sign samples for review. Material certifications for metals.

PART 2 – PRODUCTS

GENERAL

Cast-In-Place Concrete: 3,000 psi (Min. 28-day compressive strength) Item M.03.01 of Form 816 and Section 02510.
Town of Sprague  
Public Works Equipment Storage Building  
Baltic Reservoir Access Road  
Sprague, Ct.

Steel Pipe: M.10.05.02 of Form 816.

Chain Link Fence: Section 9.13.02 of Form 816

Gates: Per manufacturer’s recommendation

PART 3 - EXECUTION

Installation shall be in accordance with applicable contract details.

END OF SECTION
SECTION 02900 - LAWNS

PART 1 - GENERAL

RELATED DOCUMENTS

The Drawings and general provisions of the Contract, include General Conditions, apply to this Section.

DESCRIPTION OF WORK

The purpose of providing this work is for the stabilization of all disturbed areas for lawns and erosion control. Seeding shall include, but is not necessarily limited to, the following:

Prepare and seed the topsoiled areas and establish a stand of grass to stabilize all disturbed areas, acceptable to the Architect.

Maintain seeded areas until acceptance.

RELATED WORK SPECIFIED ELSEWHERE

Section 02000: Site General Conditions

Section 02210: Site Earthwork - Spreading Topsoil

QUALITY ASSURANCE

Perform work with experienced personnel under direction of a skilled foreman.

Include the following test requirements:

Test Topsoil in accordance with Section 02210.

Supply written topsoil analysis and chemical requirements for grass.

SPECIAL REQUIREMENT

During seeding operations, protect adjacent areas and restore any areas disturbed at the Architect direction.
SUBMITTALS

Topsoil analysis.

Certified statement of quantities for hydraulic seeding.

Synthetic netting manufacturer's product date, specification, and instructions for use.

Contractor's qualifications and State of Connecticut applicator's license for herbicides/pesticide.

DELIVERY, STORAGE, AND HANDLING

Deliver seed in original containers showing guaranteed analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, and location of packaging. Damaged packages are not acceptable.

PART 2 - PRODUCTS

GENERAL

Seed:

As specified on drawings.

Germination and purity minimum shall meet current standards of the Association of Official Seed Analysis.

Water: Potable

Mulch: M.13 of Form 816.

Erosion Preventative: M.13.06 of Form 816.

PART 3 - EXECUTION

GENERAL

Rates of Product Application

Topsoil: Test by a commercial or government agency approved by the Architect. Quantities of lime, fertilizer, and other amendments shall be as recommended. Each source of borrow topsoil shall have a separate test. See Section 02210.
Town of Sprague  
Public Works Equipment Storage Building  
Baltic Reservoir Access Road  
Sprague, Ct.

Material: As specified on drawings.

Grass Construction

Preparation

Loosen topsoil to a depth of 4 inches by scarifying or other disking methods. Obtain a loose friable soil.

Remove any weeds and debris and stones having any dimension greater than 1 inch.

Surface shall be approved by Architect before seeding.

Hydraulic Seeding

Mix materials with water. Keep in an agitated state so that the materials are uniformly suspended in the water.

Spraying equipment shall be so designed that when the solutions are sprayed over an area, the resulting deposits of lime, fertilizer, grass seed, and mulch shall be equal, in quantity to those specified.

Before commencing work, submit to the Architect a certified statement of the quantities of materials per 100 gallons of water, and the area that this quantity can cover.

Mechanical Seeding

Apply lime and fertilizer evenly at rates determined by topsoil test results and thoroughly incorporate into the upper 4 inches of topsoil.

Rake finish surface smooth.

Sow seed applying half the quantity in one direction and the remaining quantity at right angles to it. Do not sow seed on a windy day, or when the ground is frozen, wet, or otherwise non-tillable. See D) for rates of application.

Cover seed with a thin layer of topsoil by raking or dragging.

Roll with a hand roller not heavier than 300 lbs.

Maintain a moist seed bed at all times. Water seed bed so that the topsoil is wet to a depth of 2 inches. Apply one complete coverage to the seeded area in an 8 hour period.
Protect the seed bed with barricades, where necessary, to keep all traffic off the area.

After the grass has appeared, reseed all areas which have failed to show a uniform stand of grass.

Clean-Up

Dispose of off-site, excess materials and debris resulting from seeding work.

Leave work area clean and neat upon completion of the work.

Maintenance

Period Required: Immediately after seeding and continue until acceptance as defined in E.

Perform all reseeding, watering, mowing, weeding and rolling, insect or disease control, refertilizing, and repair of washouts which are necessary.

Water minimum 3 times per week so that the depth of moisture is minimum 4 inches.

When average height of grass becomes 3 1/2 inches, mow to the height of 2 1/2 inches. Remove heavy clippings, minimum 2 mowings.

Inspection and Acceptance

Submit written notice requesting inspection by the Architect at least 10 days prior to the anticipated date.

No grass area will be inspected for acceptance: prior to the completion of this Contract; minimum 30 days from date of seeding prior to the completion of 2 mowings.

An acceptable seeded grass area shall consist of an uniform stand of at least 60% established permanent grass species, with a uniform count of at least 100 plants per square foot.

Architect will be the judge of acceptance.

Unacceptable seeded areas shall be reconstructed under the direction of the Architect.

END OF SECTION
SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for mechanical and electrical equipment.
3. Metal bollards.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 03300 "Cast-In-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.

1.03 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers’ written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.04 ACTION SUBMITTAGS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations,
sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for mechanical and electrical equipment.
3. Metal bollards.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Welding certificates.

C. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.06 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

   1. AWS D1.1, "Structural Welding Code - Steel."

1.07 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.02 METALS

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

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: ASTM A 500, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53, Standard Weight (Schedule 40) unless otherwise indicated.

2.03  FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

D. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six (6) times the load imposed when installed in unit masonry and four (4) times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

E. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

F. Post-Installed Anchors: Torque-controlled expansion anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.


2.04  MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099113 “Exterior Painting”.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by the manufacturer for interior and exterior applications.

D. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.05  FABRICATION, GENERAL
A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1½ inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.06 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Furnish inserts for units installed after concrete is placed.
C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

2.07 METAL FLOOR PLATE

A. Fabricate from aluminum diamond plate of thickness indicated below:
   1. Thickness: 1/16 inch.

2.08 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

B. Fabricate sleeves for bollard anchorage from steel pipe or tubing with ¼-inch-thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and ¾ inch larger than OD of bollard.

C. Galvanize and prime bollards.

2.09 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two (2) integrally welded steel strap anchors for embedding in concrete.

2.10 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application
Specification No. 1: Shop, Field, and Maintenance Painting of Steel, "for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

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

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers’ written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for overhead doors securely to, and rigidly brace from, building structure.

3.03 INSTALLING METAL BOLLARDS
A. Fill bollards solidly with concrete and allow concrete to cure seven (7) days before installing.

B. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

C. Fill bollards solidly with concrete, mounding top surface to shed water.

3.04 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000
SECTION 07725 - SNOW GUARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Rail-type, seam-mounted snow guards.

1.03 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for snow guards.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.

1. Include details of rail-type snow guards.
2. Include calculation of number and location of snow guards based on snow load, roof slope, roof type, components, spacings, and finish.

C. Samples: Base, bracket, and 12-inch-long rail.

1.04 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of snow guard, for tests performed by manufacturer and witnessed by a qualified testing agency.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Structural Performance:

1. Snow Loads: As indicated on Drawings.

2.02 RAIL-TYPE SNOW GUARDS
A. Seam-Mounted, Rail-Type Snow Guards:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Alpine Snow Guards, a division of Vermont Slate & Copper Services, Inc.
   b. S-5! Solutions
   c. Sno-Gem, Inc.
   d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with two (2) rails.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.
   1. Verify compatibility with and suitability of substrates including compatibility with existing finishes or primers.

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

3.02 INSTALLATION

A. Install snow guards according to manufacturer's written instructions.

B. Attachment for Standing-Seam Metal Roofing:
   1. Do not use fasteners that will penetrate metal roofing, or fastening methods that void metal roofing finish warranty.
   2. Seam-Mounted, Rail-Type Snow Guards: Stainless-steel clamps attached to vertical ribs of standing-seam metal roof panels.

END OF SECTION 07725
SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Polysulfide joint sealants.
4. Latex joint sealants.
5. Solvent-release-curing joint sealants.
6. Preformed joint sealants.
7. Acoustical joint sealants.

B. Related Sections:

1. Section 08800 "Glazing" for glazing sealants.

1.03 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Warranties: Sample of special warranties.
1.05 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.06 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.07 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with
one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

F. Colors of Exposed Joint Sealants: As selected by Architect and Owner from manufacturer's full range.

2.02 SILICONE JOINT SEALANTS

A. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Pecora Corporation; 898
   b. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.03 POLYSULFIDE JOINT SEALANTS

A. Multicomponent, Nonsag, Polysulfide Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. BASF Building Systems; Sonolastic Polysulfide Sealant
   b. Pecora Corporation; Synthacalk GC-2+
   c. W. R. Meadows, Inc.; Deck-O-Seal Gun Grade
   d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.04 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Building Systems; **Sonolac**
   b. Bostik, Inc.; **Chem-Calk 600**
   c. Pecora Corporation; **AC-20+**
   d. Tremco Incorporated; **Tremflex 834**
   e. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.05 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation; **AC-20 FTR**
   b. USG Corporation; **SHEETROCK Acoustical Sealant**
   c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.06 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.07 MISCELLANEOUS MATERIALS

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

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.02 PREPARATION

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

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
   a. Concrete.
   b. Masonry.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without
disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

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

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

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
   4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
   5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
      a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a
continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.04 CLEANING

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

3.05 PROTECTION

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

3.06 JOINT-SEALANT SCHEDULE


1. Joint Locations:
   b. Control and expansion joints in unit masonry.
   c. Joints between metal panels.
   d. Joints between different materials listed above.
   e. Perimeter joints between materials listed above and frames of doors, windows and louvers.
   f. Control and expansion joints in ceilings and other overhead surfaces.
   g. Other joints as indicated.


1. Joint Locations:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Tile control and expansion joints.
   d. Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
   e. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
   f. Other joints as indicated.

C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:
   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Tile control and expansion joints where indicated.
   c. Other joints as indicated.

2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.


1. Joint Location:
   a. Acoustical joints where indicated.
   b. Other joints as indicated.


END OF SECTION 07920
SECTION 08110 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

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

1.02 SUMMARY
A. Section includes hollow-metal work.
B. Related Requirements:
   1. Section 08700 “Door Hardware” for door hardware for hollow-metal doors and frames.

1.03 DEFINITIONS
A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.04 COORDINATION
A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.05 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
B. Samples for Initial Selection: For units with factory-applied color finishes.

1.06 INFORMATIONAL SUBMITTALS
A. Product Test Reports: For each type of hollow-metal frame assembly, for tests performed by a qualified testing agency.
B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
B. Deliver welded frames with two (2) removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum ¼-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:
   1. Steelcraft; an Ingersoll-Rand company

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Ceco Door Products; an Assa Abloy Group company
   2. Curries Company; an Assa Abloy Group company
   3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.02 REGULATORY REQUIREMENTS

A. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.03 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.


   1. Physical Performance: Level A according to SDI A250.4.
   2. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1¼ inches.
      c. Face: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A40 coating.
      d. Edge Construction: Model 2, Seamless.
      e. Core: Vertical steel stiffener.
   3. Frames:
a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A40 coating.
b. Construction: Face welded.


2.04 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
   2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
   3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two (2) holes to receive fasteners.

2.05 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B.

C. Frame Anchors: ASTM A 879, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-
developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

H. Glazing: Comply with requirements in Section 088000 “Glazing”.

I. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.06 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.

2. Fire Door Cores: As required to provide fire-protection ratings indicated.


4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.

5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.

6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

7. Astragals: Provide overlapping astragal on one (1) leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum ¾ inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

4. Floor Anchors: Weld anchors to bottoms of jambs with at least four (4) spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.

5. Jamb Anchors: Provide number and spacing of anchors as follows:

   a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
1) Two (2) anchors per jamb up to 60 inches high.
2) Three (3) anchors per jamb from 60 to 90 inches high.
3) Four (4) anchors per jamb from 90 to 120 inches high.
4) Four (4) anchors per jamb plus one (1) additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
1) Three (3) anchors per jamb up to 60 inches high.
2) Four (4) anchors per jamb from 60 to 90 inches high.
3) Five (5) anchors per jamb from 90 to 96 inches high.
4) Five (5) anchors per jamb plus one (1) additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
a. Single-Door Frames: Drill stop in strike jamb to receive three (3) door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce frames to receive non-templated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Provide fixed frame moldings on secure side of interior doors.
3. Provide loose stops and moldings on inside of hollow-metal work.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.07 STEEL FINISHES
A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and...
field-applied coatings despite prolonged exposure.

2.08 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

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

3.02 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

   a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.

   b. Install frames with removable stops located on secure side of opening.

   c. Install door silencers in frames before grouting.

   d. Remove temporary braces necessary for installation only after frames have been properly set and secured.

   e. Check plumb, square, and twist of frames as walls are constructed. Shim as
necessary to comply with installation tolerances.

f. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. In-Place Concrete Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

4. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.

b. Between Edges of Pairs of Doors: 1/8 inch to ¼ inch plus or minus 1/32 inch.

c. At Bottom of Door: ¾ inch.

d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.
C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08110
SECTION 08360 - SECTIONAL DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes electrically operated sectional doors.

B. Related Sections:

1. Section 05500 "Metal Fabrications" for miscellaneous steel supports.
2. Division 16 Sections for electrical service and connections for powered operators and accessories.

1.03 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer’s product data.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Include diagrams for power, signal, and control wiring.

C. Samples: For units with factory-applied finishes.

1. Include Samples of accessories involving color selection.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For special warranties.

1.05 CLOSEOUT SUBMITTALS
A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.


1.07 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Failure of components or operators before reaching required number of operation cycles.
   c. Faulty operation of hardware.
   d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
   e. Delamination of exterior or interior facing materials.

2. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain sectional doors from single source from single manufacturer.

1. Obtain operators and controls from sectional door manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
1. Design Wind Load: As indicated on Drawings.
3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
   a. Deflection of door in horizontal position (open) shall not exceed 1/120 of the door width.
   b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.

2.03 DOOR ASSEMBLY

A. Steel Sectional Door: Sectional door formed with hinged sections.
   1. Basis-of-Design Product:
      a. Overhead Door Corporation; **Thermacore 596**
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Clopay Building Products; a Griffon company
      b. Raynor
      c. Wayne-Dalton Corp.
      d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Operation Cycles: Door components and operators capable of operating for not less than one hundred thousand (100,000). One (1) operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E 283 or DASMA 105.

D. Installed R-Value: 17.5 deg F x h x sq. ft./Btu.

E. Steel Sections: Zinc-coated (galvanized) steel sheet with G90 zinc coating.
   1. Section Thickness: 2 inches.
   2. Face, Steel Sheet Thickness: 20-gauge nominal coated thickness.
      a. Surface: Manufacturer's standard, flush.
   3. Insulation: Board.

F. Track Configuration: Custom-lift track to slope parallel with roof structure; **3-inch Heavy Duty Track**.

G. Weatherseals: Fitted to bottom and top and around entire perimeter of door. Provide combination bottom weatherseal and sensor edge.
H. Windows: Size as indicated on Drawings, with square corners, in rows as indicated on Drawings; installed with insulated glazing of the following type:

1. Insulating Glass: Manufacturer's standard insulated double-strength glass.

I. Roller-Tire Material: Case-hardened steel.

J. Locking Devices: Equip door with slide bolt for padlock and chain lock keeper.

K. Counterbalance Type: Torsion spring.

L. Electric Door Operator:

1. Usage Classification: Standard duty, up to sixty (60) cycles per hour.
2. Operator Type: Jackshaft, side mounted.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
5. Emergency Manual Operation: Cable type to align with window mullions.
6. Obstruction-Detection Device: Automatic photoelectric sensor and electric sensor edge on bottom bar; self-monitoring type.
   a. Sensor Edge Bulb Color: Black.
7. Control Station: Interior.
8. Other Equipment: Audible and visual signals and radio-control system.
9. Timer/Controller: Control interface device to open and close doors in response to DPW Electronic Notification from Trucks
   a. Override Switch: Provide to override automatic closing.

M. Door Finish:

1. Baked-Enamel or Powder-Coat Finish: Color and gloss as selected by Architect and Owner from manufacturer's full range.
2. Finish of Interior Facing Material: Manufacturer's standard, white.

2.04 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.05 STEEL DOOR SECTIONS

A. Exterior Section Faces and Frames: Fabricate from zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653, with indicated zinc coating and thickness.

1. Fabricate section faces from single sheets to provide sections not more than 24 inches high and of indicated thickness. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weathertight seal, with a reinforcing flange.
2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.

B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch-nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064-inch-thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.

C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile.

D. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place. Ensure that reinforcement does not obstruct vision lites.

E. Provide reinforcement for hardware attachment.

F. Board Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free polystyrene or polyurethane board insulation, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84; or with glass-fiber-board insulation. Secure insulation to exterior face sheet. Enclose insulation completely within steel sections that incorporate the following interior facing material, with no exposed insulation:

G. Interior Facing Material: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653, with indicated thickness.

H. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

2.06 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances shown on Drawings. Provide complete system including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type, size, weight, and loading.

1. Galvanized Steel: ASTM A 653, minimum G60 zinc coating.
2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
3. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches apart for door-drop safety device.

a. Vertical Track Assembly: Continuous reinforcing angle attached to track and attached to wall with jamb brackets.

b. Horizontal Track Assembly: Continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.
B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

C. Windows: Manufacturer's standard window units of type and size indicated and in arrangement shown. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors, as required. Provide removable stops of same material as door-section frames.

2.07 HARDWARE

A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch-nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges where required, for doors over 16 feet wide unless otherwise recommended by door manufacturer.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch-diameter roller tires for 3-inch-wide track and 2-inch-diameter roller tires for 2-inch-wide track.

D. Push/Pull Handles: For push-up or emergency-operated doors, provide galvanized-steel lifting handles on each side of door.

2.08 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks, located on single-jamb side, operable from inside only.

B. Chain Lock Keeper: Suitable for padlock.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.09 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.

B. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft. Provide one (1) additional midpoint bracket for shafts up to 16 feet long and two (2) additional brackets at one-third points to support shafts more than 16 feet long unless closer
spacing is recommended by door manufacturer.

C. Cables: Galvanized-steel lifting cables with cable safety factor of at least five (5) to one (1).

D. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

E. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

F. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.

1. Heavy Duty Sectional Door Operator: Model RHX True Gear Head Type Door Operator:
2. Lift Clearance Sectional Door

D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements unless otherwise indicated.

1. Electrical Characteristics:
   b. Volts: 120 V.
   c. Hertz: 60.

2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
3. Motor Size: Minimum 1 HP but sized large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring:
5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

6. Use adjustable motor-mounting bases for belt-driven operators.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
   a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensor device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.

2. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
   a. Self-Monitoring Type: Two-wire configured device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure, push-button control labeled "Close."

1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure. Provide with wiring, circuitry and raceways as required.


I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility. Mount signals on interior of building only.

L. Portable, Radio-Control System: Consisting of the following:
1. Three-channel universal coaxial receiver to open, close, and stop door. Provide one (1) transmitter for each door for each vehicle.

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

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

3.02 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Tracks:

1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.

2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

3. Repair galvanized coating on tracks according to ASTM A 780.

C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install according to UL 325.

3.03 STARTUP SERVICES
A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.04 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust doors and seals to provide weathertight fit around entire perimeter.

D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780.

3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 08360
SECTION 08700- DOOR HARDWARE

PART 1 GENERAL

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

1.02 WORK INCLUDES
   A. Base Bid:
      1. General Contractor to provide finish hardware as indicated on the hardware schedule and specified herein.

1.03 REFERENCES
   C. AWI - Architectural Woodwork Institute.
   D. BHMA - Builders' Hardware Manufacturers Association.
   E. DHI - Door and Hardware Institute.
   F. NAAMM - National Association of Architectural Metal Manufacturers.
   H. SDI - Steel Door Institute.

1.04 COORDINATION:
   A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

1.05 QUALITY ASSURANCE
   A. Manufacturers: Companies specializing in manufacturing door hardware with minimum 3 years experience.
   B. Hardware Supplier: Company specializing in supplying commercial door hardware with 2 years experience, with AHC designation.
   C. Hardware Installer: Employ a qualified carpentry person to perform the work of this Section.
   D. Manufacturers: Items of manufacturers other than those scheduled will be acceptable for substitution provided they meet the quality standards of this Specification for finish, function and grade. For the purpose of establishing quality standards and design, only one manufacturer of each type of hardware has been scheduled.

1.06 SUBMITTALS
   A. Submit schedule, shop drawings, and product data under provisions of Section 01340.
   B. Indicate locations and mounting heights of each type of hardware.
C. Provide product data on specified hardware.

1.07 OPERATION AND MAINTENANCE DATA
A. Submit operation and maintenance data under provisions of Section 01730.
B. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.08 DELIVERY, STORAGE, AND HANDLING
A. Store and protect products under provisions of Section 01620.
B. Package hardware items individually; label and identify package with door opening code to match hardware schedule.
C. Deliver permanent keys to Owner direct from hardware supplier.
D. Protect hardware from theft by cataloging and storing in secure area.

1.09 MAINTENANCE MATERIALS
A. Provide special wrenches and tools applicable to each different or special hardware component.
B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.01 GENERAL
A. Fasteners: Hardware shall be complete with all necessary screws, bolts, anchors or other fasteners for proper application. Such fasteners shall be of suitable size and type, and shall harmonize with hardware as to materials and finish.
B. Door Closers: Closers shall not be installed on the outside of any exterior door. Whenever it is necessary to install a closer on the side of the door away from the butts, a parallel arm shall be used. Corner of soffit brackets are not permitted unless no other method of installation is possible. All closers shall be fastened with through bolts and grommet nuts.

2.02 KEYING. Furnish 2 key blanks for each lock specified plus ten additional blanks to be used as master keys.

2.03 FINISHES: All hardware to be (BHMA 630) Stain Stainless Steel, except as noted.

2.04 HINGES
A. Description:
   1. 4-1/2" x 4-1/2" at doors not more than 36" wide
   2. 5" x 4-1/2" at doors more than 36" wide.
   3. Non-removable pins at exterior locations
B. Acceptable Manufacturers:
   1. Type 1 (ball bearing) at doors with closers:
      a. Hager BB1279
      b. Stanley FBB179
2. Type 2 (non-ball bearing) at doors without closers
   a. Hager 1279
   b. Stanley F179

3. Type 3 (ball-bearing) heavy weight hinges
   a. Hager BB1168
   b. Stanley FBB168

2.05 CLOSER
   A. Description: Unless called out to be otherwise, mount on face of door on push side; with hold-open and delayed action features.
   B. Acceptable manufacturers
      4. Norton 7500
      5. LCN 4041
      6. Corbin Russwin DC2200/DC2210

2.06 LOCK/LATCH
   A. Description:
      1. Handicapped accessible lever design
      2. 2-3/4" backset typical.
   B. Acceptable Manufacturers:
      1. Office Function: Mortise (Keyed)
         a. Corbin Russwin - #ML2051 (ANSI F04)
         b. Sargent - 8200 Series - #55 Office (ANSI F04)
         c. Schlage - #L9050 (ANSI F04)
      2. Exterior Door: Rim Exit Device (Keyed)
         a. Corbin Russwin - #ED 4200 (Classroom Function) (ANSI 06)
         b. Sargent - 8500 Series - #13 (ANSI 08)
         c. Schlage - 25-R Series 25-R-L
      3. Lever Design
         a. Corbin Russwin - Newport
         b. Sargent - “L” Lever
         c. Schlage - Standard Levers “06”

2.07 KICKPLATES
   A. Construction:
      1. 10" high x width of door
      2. .050", 18 ga.
      3. Place on kick side of scheduled doors
      4. Finish - US32D
   B. Acceptable Manufacturers:
      1. Hager - 190S CSK

2.08 THRESHOLD
   A. ADA Compliant aluminum threshold with vinyl bumper seal, ½" maximum overall height, widths and lengths to fit specific opening conditions.
B. Acceptable Manufacturers
1. National Guard Products, Inc.
2. Hager
3. Pemko

2.09 WEATHERSTRIPPING
A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
   1. Basis-of-Design Product:
      a. Zero International
         1. Head and Jamb: #328AA, solid neoprene in an extruded aluminum housing.
         2. Sill: #339AA with extruded aluminum housing, solid neoprene.
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. National Guard Products.
      b. Pemko Manufacturing Co.; an ASSA ABLOY Group company.

2.10 DOOR BOTTOM
A. Description:
   1. Clear anodized aluminum extrusion
   2. Finned cold weather vinyl bulb
   3. With integral drip
   4. Make continuous along bottom of scheduled doors

B. Acceptable manufacturers:
   1. Pemko - 216V
   2. Hager - 783S

2.11 RAIN CAP
A. Description:
   1. Anodized aluminum extrusion.
   2. Mount to door frame immediately above door.

B. Acceptable Manufacturers:
   1. Pemko - 346
   2. Reese - R201D

PART 3 – EXECUTION

3.01 INSTALLATION:
A. All hardware shall be applied and installed in accordance with the Finish Hardware schedule. Care shall be exercised not to mar or damage adjacent work.
B. Contractor to provide a secure lock-up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items that are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses both before and after installation.

C. No hardware is to be installed until the hardware manufacturers have provided a pre-installation class. This is to insure proper installation of the specified products.

D. Mount closers so that closers and closer arms are not visible on corridor or public side of doors or on exterior of building.

E. Mounting Heights - Finished Floor to Center Line of:
   1. Locksets: 38 inches.
   2. Push and pull plates: 42 inches.
   3. Dead locks: 48 inches.
   5. Cross bar exit devices: 38 inches.
   6. Top hinge: Maximum 10 inches from frame head.
   7. Bottom hinge: Maximum 12-1/2 inches from floor.

3.02 ADJUSTING AND CLEANING:

A. Contractor shall adjust all hardware in strict compliance with manufacturer’s instructions. Prior to turning project to owner, contractor shall clean and make any final adjustments to the finish hardware.

3.03 PROTECTION:

A. Contractor shall protect the hardware, as it is stored on construction site in a covered and dry place.

B. Contractor shall protect exposed hardware installed on doors during the construction phase.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

   A. Base Bid: Contractor provide:
      1. Glass and glazing for doors, windows, sidelights and borrowed lights
      2. Glass for unframed mirrors.
      3. Glass and glazing for aluminum frames as shown on drawings.

1.03 REFERENCES


   B. ASTM E84 - Surface Burning Characteristics of Building Materials.

   C. FS DD-G-451 - Glass, Float or Plate, Sheet, Figured (Flat, for Glazing, Mirrors and Other Uses).

   D. FS DD-G-1403 - Glass, Plate (Float), Sheet, Figured, and Spandrel (Heat Strengthened and Fully Tempered).

   E. FS TT-G-410 - Glazing Compound, Sash (Metal) for Back Bedding and Face Glazing (Not for Channel or Stop Glazing).


   I. FS TT-S-001657 - Sealing Compound: Single Component, Butyl Rubber Based Solvent Release Type (for Buildings and Other Types of Construction).

   J. SIGMA No. 64-7-2 - Specification for Sealed Insulating Glass Units.


1.05 SUBMITTALS
A. Submit product data under provisions of Section 01300.

B. Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Provide data on glazing sealant. Identify colors available.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to site under provisions of Section 01600.

B. Store and protect products under provisions of Section 01600.

1.07 WARRANTY

A. Provide 5 year manufacturer's warranty for mirrors and 10 years for sealed units, under provisions of Section 01700.

B. Warranty: Include coverage of sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 - PRODUCTS

2.01 ACCEPTABLE GLASS MANUFACTURERS

A. P.P.G.
B. L.O.F.
C. Globe Amerada Glass Co.
D. Noviflex
E. Guardian Industries.
F. Glasstemp

2.02 GENERAL

A. Tempered glass lights as required by code and as recommended by manufacturer complying with FS DD-G-1403 and ANSI Z97.1.

B. Temper units without tong marks.

2.03 GLASS MATERIALS

A. Typical windows: 1" thick insulated units consisting of 1/4" tinted, ½" air space and 1/4" clear. Performance as listed below:
   1. Transmittance
      a. UV 6%
      b. Visible 12%
      c. Total solar energy 19%
2. Reflectance
   a. Visible 5%
   b. Total solar energy 5%

3. U Value
   a. Winter/night 0.47
   b. Summer/day 0.50

4. Shading coefficient 0.34

B. Exterior Doors: ¼" inch tinted, tempered. Performance as shown below:
   1. Transmittance
      a. UV 7%
      b. Visible 14%
      c. Total solar energy 26%
   2. Reflectance
      a. Visible 5%
      b. Total solar energy 5%
   3. U Value
      a. Winter/night 1.02
      b. Summer/day 0.93
   4. Shading coefficient 0.55

2.04 ACCEPTABLE GLAZING COMPOUND MANUFACTURERS
A. PPG
B. LOF
C. Guardian

2.05 GLAZING COMPOUNDS
A. Glazing Compound: FS TT-G-410; color selected by architect.
B. Butyl Sealant: FS TT-S-001657; Shore A hardness of 10-20; color selected by Architect; non-skinning.
C. Acrylic Sealant: FS TT-S-230, Type II, Class A; single component; cured Shore A hardness of 15-25; color selected by Architect.
D. Polysulphide Sealant: FS TT-S-227; Class A, Type 2; two component; cured Shore A hardness of 15-25; color selected by Architect.
E. Silicone Sealant: FS TT-S-1543; Class A; single component; chemical curing; capable of water immersion without loss of properties; cured Shore A hardness of 15-25; color selected by Architect.

2.06 GLAZING ACCESSORIES
A. Setting Blocks: Neoprene; 79-90 Shore A durometer hardness; 4 inch long x 3/8 inch wide x 1/4 high.
B. Spacer Shims: Neoprene; 50 Shore A durometer hardness; 3 inch long x 1/4 inch wide x 1/4 inch thick; self adhesive one face.
C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10-15 Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Splines: Resilient polyvinylchloride extruded shape to suit glazing channel retaining slot;

E. Glazing Clips: Manufacturer's standard type.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready for work of this Section.

B. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses.

C. Prime surfaces scheduled to receive sealant.

D. Carefully measure glass openings and provide minimum required tolerances and clearances.

3.03 GENERAL

A. Install in accordance with manufacturers' printed instructions

B. Prevent nicks, abrasions & other damage likely to develop stress on edges.

3.04 EXTERIOR COMBINATION METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sightline. Seal corners by butting tape and dabbing with butyl sealant.

B. Apply heel bed of butyl sealant along exterior void ensuring full contact with pane.

C. Place setting blocks at 1/3 points.

D. Rest glass on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane.

E. Place glazing tape on glass with tape 1/4 inch below sightline.

F. Apply cap bead of sealant along exterior void, to uniform line, flush with sightline. Tool or wipe sealant surface with solvent for smooth finish.
3.05 INTERIOR DRY METHOD (TAPE AND TAPE)

A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sightline.

B. Place setting blocks at 1/3 points.

C. Rest glass on setting blocks and push against tape for full contact at perimeter of pane.

D. Place glazing tape on free perimeter of pane in same manner described above.

E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

F. Knife trim protruding tape.

3.06 CLEANING/PROTECTION

A. After installation, mark pane with an "X" by using plastic tape or removable paste.

B. Clean all surfaces of glazing materials, mortar, plaster, paint and other soiling or contaminates.

C. Remove labels after work is completed.

D. Replace broken, scratched, chipped, or otherwise damaged glass.

END 08800
SECTION 09900 – PAINTING

PART 1 - GENERAL

1.01 WORK INCLUDES

1.02 Base Bid: Contractor provide:
   A. Complete interior and exterior surface preparation and finishing, including mechanical and electrical equipment.
   B. Examine specifications for various other trades and their provisions regarding their painting. Surfaces that are left unfinished by other sections of specifications, shall be painted or finished as a part of this Section.
   C. Colors, including deep tones, will be selected by the Architect. Deep tones or accent colors will not exceed 30% of surfaces to be painted. Number of colors to be used on job will be determined by Architect.
   D. Painting shall also include all roof top equipment.

1.03 Only low / no VOC products are to be used.

1.04 SURFACES NOT TO RECEIVE FIELD FINISHING

   A. Copper, bronze, chromium plate, nickel, stainless steel, Monel metal, lead, lead-coated copper, and weathering steel shall not be painted or finished except as otherwise specified or scheduled. Other surfaces not to be painted include prefinished wall, ceiling, and floor coverings; items with factory applied final finish; plenums above suspended ceilings.

1.05 REFERENCES


1.06 DEFINITIONS: Conform to ANSI/ASTM D16 for interpretation of terms used in this Section.

1.07 QUALITY ASSURANCE

   A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with 3 years experience.
   B. Applicator: Company specializing in commercial painting and finishing with 2 years experience.
   C. Product Labels: Include manufacturer's name, type of paint, stock number, color and label analysis on label of containers.

1.08 SUBMITTALS
A. Submit product data, color selection samples and manufacturer's application instructions under provisions of Section 01300.

B. Provide product data on all finishing products.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store and protect products under provisions of Section 01600.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 75 percent, unless required otherwise by manufacturer's instructions.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish and Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft. candles measured mid-height at substrate surface.

1.11 SCAFFOLDS: Provide adequate safe ladders, scaffolds, and stages necessary to complete work.

1.12 PROTECTION: Protect completed finish and paint work, and protect adjacent finish surfaces from paint splatter, spills and stains. Use adequate drop cloths and masking procedures during progress of work.

1.13 PRECAUTIONS

A. Paints, oils, thinners and other flammable items shall be stored outside the building if possible, and whenever necessary to store inside they shall be stored in approved containers when not in actual use during the painting job. The fire hazard shall be kept at a minimum.
B. Precaution shall be taken to protect the public and construction workers during the progress of the work.

C. Fire Extinguishers: Contractor shall furnish a temporary fire extinguisher of suitable chemicals and capacity, located near the flammable materials as described.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. PPG Pittsburgh Paints
B. Sherwin Williams
C. Materials selected for coating systems for each type surface shall be product of a single manufacturer unless otherwise specified. Secondary products such as linseed oil, turpentine and shellacs shall be first quality products of a reputable manufacturer.

2.02 MATERIALS

A. Coatings: Ready mixed. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
B. Coatings: Good flow and brushing properties; capable of drying or curing free of streaks or sags.
C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.03 PRODUCTS

A. Metal Primer:
   1. PPG “Devguard Alkyd Metal Primer 4160”

B. Metal Finish:
   1. PPG “Devflex High Performance Waterborne Semigloss Enamel 4216”

C. Concrete, Masonry Block, Plaster, Gypsum Board Finish, & Plywood:
   1. PPG “Ultrahide 150 Interior Eggshell 1410”

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report to Architect any condition that may potentially affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
D. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
E. Beginning of installation means acceptance of existing surfaces and substrate.

3.02 PREPARATION

A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.
B. Correct minor defects and clean surfaces which affect work of this Section.
C. Shellac and seal marks which may bleed through surface finishes.
D. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
E. Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.03 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfigurement.
B. Repair damage to other surfaces caused by work of this Section.
C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
D. Remove empty paint containers from site.

3.04 APPLICATION

A. The intent of these Specifications is to produce the highest quality appearance of paint and finish surfaces. Employ skilled mechanics only. The proper preparation of all surfaces will be strictly enforced and wherever finished surfaces show any defects due to improper preparation, workmanship, etc., the defects shall be removed and the work refinished at the expense of the Contractor.
B. Apply products in accordance with manufacturer's instructions. Final finish costs shall have visual evidence of solid hiding and uniform appearance, and shall be free and smooth of brush marks, streaks, sags, runs, laps, or skipped areas.
C. Do not apply finishes to surfaces that are not dry.
D. Apply each coat to uniform finish and thickness.
E. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
F. Sand lightly between coats to achieve required finish.
G. Allow applied coat to dry before next coat is applied.
H. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
I. Edges of paint adjoining other materials or colors shall be sharp and clean with no overlapping.
J. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
K. Move electrical plates, hardware, light fixture trim, and fittings prior to finishing.
L. Paint exposed roof ventilators, goose necks, exhaust fans and other items on the roof with 2 coats exterior enamel.

3.05 CLEANING/TOUCH-UP

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.
B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.
D. Spot painting will be allowed to correct soiled or damaged paint surfaces only when touch-up spot will blend into surrounding finish and is invisible to normal viewing. Otherwise, re-coat entire section to corners or visible stopping point.

3.06 SCHEDULE OF FINISHES

A. Interior Surfaces:

B. Hollow Metal Doors and door frames:
   1. One prime coat if unprimed; if primed, touch up defects or blemished in prime coat.
   2. Two finish coats.

C. Electrical Panels which are outside of mechanical/electrical rooms:
   1. Two finish coats.

D. Other ferrous metals:
   1. One prime coat if unprimed; if primed, touch up defects or blemished in prime coat.
   2. Two finish coats.

E. Exterior Surfaces:

F. Metals:
   1. One prime coat if unprimed; if primed, touch up defects or blemished in prime coat.
      a. Two finish coats.
SECTION 10440 - FIRE EXTINGUISHERS

PART 1 - GENERAL

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

1.02 SUMMARY
   A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.03 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.04 INFORMATIONAL SUBMITTALS
   A. Warranty: Sample of special warranty.

1.05 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.06 QUALITY ASSURANCE
   A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
   B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
      1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.07 COORDINATION
   A. Coordinate type and capacity of fire extinguishers to ensure fit and function.

1.08 WARRANTY
   A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
      1. Failures include, but are not limited to, the following:
a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six (6) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Kidde Pro 20 MP Fire Extinguisher 466206 in three locations
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.
   2. Valves: Manufacturer's standard.
   3. Handles and Levers: Manufacturer's standard.
   4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

2.02 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

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

3.02 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations coordinated with the authorities having jurisdiction.
   1. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10440
SECTION 13340 - METAL BUILDING SYSTEMS

PART 1  GENERAL

1.01 SECTION INCLUDES

A. Section Includes:
   1. Structural-steel framing.
   2. Metal roof panels.
   3. Metal wall panels.
   4. Metal soffit panels.
   5. Personnel doors and frames.
   7. Accessories.

1.02 RELATED REQUIREMENTS

A. Related Requirements:
   1. Section 03300 “Cast-In-Place Concrete” for footings and foundations
   2. Section 07725 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface.
   3. Section 08360 "Sectional Doors" for sectional vehicular doors in metal building systems.

1.03 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC):
   1. AISC 360 - Specification for Structural Steel Buildings.
   2. AISC 341 – Seismic Provisions for Structural Steel Buildings (when appropriate).
   3. AISC Design Guide 3 – Serviceability for Steel Buildings

B. American Iron and Steel Institute (AISI):
   1. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.

C. American Welding Society (AWS):

D. ASTM International (ASTM):
   2. ASTM A 653 / A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E. Metal Building Manufacturers Association (MBMA):

F. North American Insulation Manufacturers Association (NAIMA):
   1. NAIMA 202 – Standard For Flexible Fiber Glass Insulation to be Laminated for Use in Metal Buildings.

G. The Society for Protective Coatings (SSPC):
   1. SSPC-Paint 15 - Primer for Use Over Hand Cleaned Steel performs to SSPC-Paint 15 standards.
   2. SSPC-SP2 – Hand Tool Cleaning.

H. Underwriters Laboratories (UL):

I. US Army Corps of Engineers (COE):

1.04 PREINSTALLATION MEETINGS

A. Convene preinstallation meeting 2 weeks before start of installation of metal building system.
B. Require attendance of parties directly affecting work of this section, including Contractor, Architect, Engineer, installer, and metal building system manufacturer’s representative.

C. Review materials, installation, protection, and coordination with other work.

1.05 SUBMITTALS

A. Comply with Section 01300 – Submittal Procedures.

B. Product Data: Submit metal building system manufacturer’s product information, specifications, and installation instructions for building components and accessories.

C. Erection Drawings: Submit metal building system manufacturer’s erection drawings, including plans, elevations, sections, and details, indicating roof framing, transverse cross-sections, covering and trim details, and accessory installation details to clearly indicate proper assembly of building components.

D. Certification: Submit written “Certificate of design and manufacturing conformance” prepared and signed by a Professional Engineer, registered to practice in Connecticut verifying that the metal building system design and metal roof system design (including panels, clips, and support system components) meet indicated loading requirements and codes of authorities having jurisdiction.
   1. Certification shall reference specific dead loads, live loads, snow loads, wind loads/speeds, tributary area load reductions (if applicable), concentrated loads, collateral loads, seismic loads, end-use categories, governing code bodies, including year, and load applications.
   2. Submit certification 1 week before bid date on the metal building system manufacturer’s letterhead.

E. Submit certification verifying that the metal roof system has been tested and approved by Underwriter’s Laboratory as Class 90.

F. Submit certification verifying that the metal standing seam roof system has been tested in accordance with ASTM E 1592 test protocols.

G. Dealer Certification: Submit certification 1 week before bid date that the metal building system supplier or metal roof system supplier is a manufacturer’s authorized and franchised dealer of the system to be furnished.
   1. Certification shall state date on which authorization was granted.

H. Installer Certification: Submit certification 1 week before bid date that the metal building system or roof system installer has been regularly engaged in the installation of building systems of the same or equal construction to the system specified.

I. Warranty Documentation: Submit manufacturer’s standard warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:
   1. Manufacturer regularly engaged, for past 10 years, in manufacture of metal building systems of similar type to that specified.
B. Installer's Qualifications:
1. Installer regularly engaged, for past 5 years, in installation of metal building systems of similar type to that specified.
2. Employ persons trained for installation of metal building systems.

C. Certificate of design and manufacturing conformance:
1. Metal building system manufacturer shall submit written certification prepared and signed by a Professional Engineer, registered to practice in Connecticut verifying that building system design and metal roof system design (including panels, clips, and support system components) meet indicated loading requirements and codes of authorities having jurisdiction.
2. Certification shall reference specific dead loads, live loads, snow loads, wind loads/speeds, tributary area load reductions (if applicable), concentrated loads, collateral loads, seismic loads, end-use categories, governing code bodies, including year, and load applications.
3. Certificate shall be on metal building system manufacturer’s letterhead.
4. Refer to Submittals article of this specification section.

D. Material Testing:
1. In addition to material certifications of structural steel, metal building system manufacturer shall provide, upon request at time of order, evidence of compliance with specifications through testing.
2. This quality assurance testing shall include testing of structural bolts, nuts, screw fasteners, mastics, and metal coatings (primers, metallic coated products, and painted coil products).

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling Requirements:
1. Store and handle materials in accordance with manufacturer’s instructions.
2. Keep materials in manufacturer’s original, unopened containers and packaging until installation.
3. Do not store materials directly on ground.
4. Store materials on flat, level surface, raised above ground, with adequate support to prevent sagging.
5. Protect materials and finish during storage, handling, and installation to prevent damage.

1.08 WARRANTY

A. Metal building system manufacturer shall provide a written weathertightness warranty for a maximum of 25 years against leaks in standing seam roof panels, arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions.
1. Warranty shall be signed by both the metal roof system manufacturer and the metal roof system installer.
2. Maximum liability of warranty shall be no less than $0.70 per square foot of roof area.

B. Metal building system manufacturer shall provide a paint film written warranty for 25 years against cracking, peeling, chalking, and fading of exterior coating on painted roof and wall panels.
1. Warranty shall be signed by metal building system or roof system manufacturer and state that the coating contains 70 percent “Kynar 500” or “Hylar 5000” resin.
2. Metal building system manufacturer shall warrant that the coating shall not peel, crack, or chip for 25 years.
3. For a period of 25 years, chalking shall not exceed ASTM D 4214, #8 rating and shall not fade more than 5 color difference units in accordance with ASTM D 2244.

C. Metal Building System Manufacturer’s Certification: Metal building system manufacturer shall submit a signed written Certification 1 week before bid date, stating that the metal roof system manufacturer or approved representative will provide warranties and Inspection and Report Service specified in this specification section.
1. Warranty terms shall be submitted with bid.

PART 2 PRODUCTS
2.01 MANUFACTURER
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Alliance Steel, Inc.
   c. BC Steel Buildings, Inc.
   d. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
   e. Ceco Building Systems; an NCI company.
   f. Metallic Building Company.
   g. Nucpr Building Systems
   h. Package Industries, Inc.

2.02 Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer

   1. Horizontal Dimensions: Measure to inside face of wall sheets.
   2. Eave Height: Measure from top of finished floor to intersection of insides of roof and sidewall sheets.
   3. Clear Height Between Finished Floor and Bottom of Roof Beams: Indicated on the Drawings.

B. Primary Structural Members:
   1. Primary Framing System: Pre-engineered metal building framing system as specified in this specification section.
   2. Frames: Welded-up plate section columns and roof beams, complete with necessary splice plates for bolted field assembly as specified in this specification section.
   3. Bolts for Field Assembly of Primary Steel: High-strength bolts as indicated on erection drawings of metal building system manufacturer.
   4. Beam and Post Endwall Frames: Endwall corner posts, endwall roof beams, and endwall posts as required by design criteria.
   5. Exterior Columns: Welded-up "H" sections or cold-formed “C” sections.
   7. Connection of Primary Structural Members: ASTM A 325 bolts through factory-punched holes.
   8. Primary Structural Members: Paint with metal building system manufacturer's standard primer with surface preparation as specified in this specification section.
C. Secondary Structural Members:
   1. Secondary Framing System: Pre-engineered metal building framing system as specified in this specification section.

D. Metal Roof System: as specified in this specification section.

E. Metal Wall System: as specified in this specification section.

F. Where metal panels are required to be painted, use coating system as specified in this specification section.

2.03 DESIGN REQUIREMENTS

A. Governing Design Code:
   1. Structural design for the building structural system shall be provided by the metal building system manufacturer for the following design criteria:
      b. Occupancy Category S-1

B. Roof Live Load:
   1. Roof live loads are loads produced during the life of the structure by moveable objects.
   2. Wind, snow, seismic, or dead loads are not live loads.
   3. Roof live loads are applied based on the Tributary Area as stated in code.

C. Roof Snow Load:
   1. Roof snow load used for designing the structure shall not be reduced and shall be the product of the
      a. Ground Snow Load (Pg): 30 psf
      b. Flat Roof Snow Load (Pf): 30 psf.
   2. Design snow load shall include the effects of minimum flat roof load limits, rain on snow, drifting
      snow, and unbalanced snow load as defined in the governing building code specified above.

D. Wind Load:
   1. Wind load used for designing the structure shall be the product of the following criteria:
      a. Basic Wind Speed (3 Sec): 130 MPH
      b. Risk Category: II
      c. Wind Exposure Category: C
      d. Wind Velocity Internal Pressure Exposure Coefficient (Kz): +/- 0.18
      e. Lateral Stiffness H/120 and or L/240 as appropriate

   2. Wind Pressure Coefficients and the design pressures shall be applied in accordance with the
governing code.

E. Seismic Load:
   1. Seismic load used for designing the structure shall be based on the following criteria:
      a. Spectral response acceleration for short periods (Ss): 0.171% g.
      b. Spectral response acceleration for 1-sec. period (S1): 0.061% g.
      c. Site Class: D.
d. Seismic Importance Factor (I): 1.0

2. Seismic loads shall be applied in accordance with the governing code.

F. Dead Load: Dead load shall consist of the weight of building system construction, such as roof, framing, and covering members.

G. Collateral Load:
1. Collateral load in pounds per square foot shall be applied to the entire structure to account for the weight of additional permanent materials other than the building system, such as sprinklers, mechanical systems, electrical systems, hung partitions, and ceilings.
2. This allowance does not include the weight of hung equipment weighing 50 pounds or more.
3. Equipment loads of 50 pounds or more shall be indicated on the Drawings and the structure shall be strengthened as required.
4. Architect will provide the metal building system manufacturer with the magnitude and approximate location of concentrated loads greater than 50 pounds before design of the building starts.

H. Auxiliary Loads: Auxiliary loads shall include dynamic loads, such as cranes and material handling systems, and will be defined in the Contract Documents.

2.04 DEFLECTIONS

A. Structural Members:
1. Maximum deflection of main framing members shall not exceed L/360 of their respective spans.
2. Maximum deflection due to snow load in roof panels and purlins shall not exceed L/240 of their respective spans.
3. Maximum deflection due to wind load in wall panels and girts shall not exceed L/180 of their respective spans.

B. Lateral deflections, or drift, at the roof level of the structure in relation to the floor or slab on grade, caused by deflection of horizontal force resisting elements, shall not exceed H/120 OR L/240 as appropriate.

C. Calculations for deflections shall be done using only the bare frame method.
1. Reductions based on engineering judgment using the assumed composite stiffness of the building envelope shall not be allowed.

2.05 STRUCTURAL STEEL FRAMING SYSTEM

A. General:
1. Design of Structural System: rigid frame with tapered or straight columns and roof beams, with gable or single-slope roof.
2. Actual Building Length:
   a. Structural line to structural line.
   b. Same as nominal; i.e., number of bays times length of bays.
   c. Structural Line: Defined as inside face of wall sheets.
3. Actual Building Width:
   a. Structural line to structural line.
   b. Nominal building width.
B. Secondary Structural Members:
   1. Purlins:
      a. "Z"-shaped, precision-roll-formed, acrylic-coated G30 galvanized steel in different
gauges to meet specified loading conditions.
      b. 8-inch deep "Z" sections.
      c. Purlins:
         1) "Z"-shaped, precision-roll-formed, acrylic-coated G30 galvanized steel in different
gauges to meet specified loading conditions.
         2) 8-inch deep "Z" sections.
      d. Truss Purlins:
         1) Cold-formed trusses, factory assembled.
         2) 30 inches, 34 inches or 40 inches deep.
      e. Outer Flange of Purlins: Factory-punched holes for panel connections.
      f. Brace purlins at intervals indicated on erection drawings furnished by metal building system
manufacturer.
      g. Concentrated Loads: Hung at purlin panel points.
   2. Eave Members:
      a. Eave Struts: Factory punched 7-inch, 8-1/2-inch, 10-inch, or 11-1/2-inch-deep "C" sections,
precision-roll-formed, acrylic-coated G30 galvanized steel in different gauges to meet
specified loading conditions.
   3. Girts:
      a. "Z" or “C”-shaped, precision-roll-formed, acrylic-coated G30 galvanized steel in different
gauges to meet specified loading conditions.
      b. 7-inch, 8-1/2-inch, 10-inch, or 11-1/2-inch-deep "Z" or “C” sections.
      c. Outer Flange of Girts: Factory-punched holes for panel connections.
   4. Bracing:
      a. Locate bracing as indicated on the Drawings.
      b. Diagonal Bracing:
         1) Hot-rolled rods of sizes indicated on the Drawings.
         2) Attach to columns and roof beams as indicated on the Drawings.
      c. Optional fixed-base wind posts or pinned-base portal frames may be substituted for wall rod
bracing on buildings as required.
      d. Flange Braces and Purlin Braces: Cold formed and installed as indicated on the Drawings.

C. Welding:
   1. Welding Procedures, Operator Qualifications, and Welding Quality Standards: AWS D1.1 -
Structural Welding Code – Steel and AWS D1.3 - Structural Welding Code – Sheet Steel.
   2. Welding inspection, other than visual inspection as defined by AWS D1.1, paragraph 6.9, shall be
identified and negotiated before bidding.
   3. Certification of Welder Qualification: Supply when requested.

D. Painting of Structural Steel Framing System:
   1. General:
      a. Structural Steel: Prime paint as temporary protection against ordinary atmospheric
conditions.
      b. Perform subsequent finish painting, if required, in field as specified in the painting section.
      c. Before painting, clean steel of loose rust, loose mill scale, dirt, and other foreign materials.
      d. Steel Fabricator: Not required to sand blast, flame clean, or pickle steel before painting,
unless otherwise specified.
   2. Primary Frames:
      a. Clean steel in accordance with SSPC-SP2.
b. Factory cover steel with 1 coat of gray water-reducible alkyd primer paint formulated to equal or exceed performance requirements SSPC-Paint 15.

c. Minimum Coating Thickness: 1.0 mil.

3. Secondary Structural Members – Roll-Formed:
   a. Hot-dipped zinc coating, ASTM A 653, G30; followed by 1 coat of clear acrylic finish.

4. Truss Purlins:
   a. Hot-dipped zinc coating, ASTM A 653, G30; followed by 1 coat of clear acrylic finish.

2.06 METAL ROOF SYSTEM

A. Metal Roof System:

B. Roof System Design:
   1. Design roof panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
   2. Design roof paneling system for a minimum roof slope of 2 inch in 12 inches.
   3. Design roof paneling system to support design live, snow, and wind loads.
   4. Endwall Trim and Roof Transition Flashings: Allow roof panels to move relative to wall panels and/or parapets as roof expands and contracts with temperature changes.

C. Roof System Performance Testing:
   1. UL Wind Uplift Classification Rating, UL 580: Class 90.
   2. Structural Performance Under Uniform Static Air Pressure Difference: Test roof system in accordance with ASTM E 1592.
   3. Roof system has been tested in accordance with U.S. Army Corps of Engineers Unified Facilities Guide Specification Section 07 61 13.

D. Roof Panels:
   1. Factory roll-formed, 24 inches wide, with 2 major corrugations, 2 inches high (2-3/4 inches including seam), 24 inches on center.
   2. Flat of the Panel: Cross flutes 6 inches on center, perpendicular to major corrugations in entire length of panel to reduce wind noise.
   3. Variable Width Panels:
      a. For roof lengths not evenly divisible by the 2’-0” panel width, factory-manufactured variable-width (9-inch, 12-inch, 15-inch, 18-inch, and 21-inch-wide) panels shall be used to ensure modular, weathertight roof installation.
      b. Minimum Length: 15 feet.
      c. Supply maximum possible panel lengths.
   4. Panel Material and Finish:
      a. 24-gauge steel coated both sides with layer of acrylic-coated Galvalume aluminum-zinc alloy (approximately 55 percent aluminum, 45 percent zinc) applied by continuous hot-dip method.
      b. Minimum 0.55-ounce coated weight per square foot as determined by triple-spot test, ASTM A 792.
      c. Apply clear acrylic film for additional protection.
   5. Panel Material and Finish:
a. 24-gauge galvanized steel, G90 coating, ASTM A 653, G90.
b. Paint with exterior” finish system, full-strength, 70 percent “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) coating.
c. PVDF Coating Warranty: Metal building system manufacturer shall warrant coating for 25 years for the following.
   1) Not to peel, crack, or chip.
   2) Chalking: Not to exceed ASTM D 4214, #8 rating.
   3) Fading: Not more than 5 color-difference units, ASTM D 2244.

6. Panel Material and Finish: Special materials, gauges, or colors as applicable for custom designs.

7. Use panels of maximum possible lengths to minimize end laps.

8. Extend eave panels beyond structural line of sidewalls.

9. Factory punch panels at panel end to match factory-punched holes in eave structural member.


11. Panel End Laps: Locate directly over, but not fastened to, a supporting secondary roof structural member and be staggered, to avoid 4-panel lap-splice condition.


14. Ridge Assembly:
   a. Design ridge assembly to allow roof panels to move lengthwise with expansion and contraction as roof panel temperature changes.
   b. Factory punch parts for correct field assembly.
   c. Install panel closures and interior reinforcing straps to seal panel ends at ridge.
   d. Do not expose attachment fasteners on weather side.
   e. Use lock seam plug to seal lock seam portion of panel.
   f. High-Tensile Steel Ridge Cover: Span from panel closure to panel closure and flex as roof system expands and contracts.

E. Provision for Expansion and Contraction:

1. Provision for Thermal Expansion Movement of Roof Panels: Clips with movable tab.
   a. Stainless Steel Tabs: Factory centered on roof clip when installed to ensure full movement in either direction.
   b. Maximum Force of 8 Pounds: Required to initiate tab movement.
   c. Each Clip: Accommodates a minimum of 1.25-inch movement in either direction.

2. Roof: Provide for thermal expansion and contraction without detrimental effects on roof panels, with plus or minus 100-degree F temperature difference between interior structural framework of building and of roof panels.

F. Fasteners:

1. Make connections of roof panels to structural members, except at eaves, with clips with movable stainless steel tabs, seamed into standing seam side lap.

2. Fasten panel clips to structural members with fasteners in accordance with erection drawings furnished by metal building system manufacturer, using factory-punched holes in structural members.
   a. Fasteners: Metal-backed rubber washer to serve as torque indicator.

3. Exposed fasteners penetrating metal roof membrane at the following locations do not exceed the frequency listed:
   a. Basic Panel System: 0 per square foot.
   b. High Eave Trim, No Parapet: 2 per linear foot.
Town of Sprague
Public Works Equipment Storage Building
Baltic Reservoir Access Road
Sprague, CT

c. Exterior Eave Gutter: 2 per linear foot.
d. Panel Splices: 2 per linear foot.
e. Gable Trim: 0 per linear foot.
f. High Eave with Parapet: 0 per linear foot.
g. Ridge: 0 per linear foot.
h. Low Eave Structural: 1.5 per linear foot.

G. Accessories:
1. Accessories (i.e., ventilators, skylights, gutters, fascia): Standard with metal building system manufacturer, unless otherwise noted and furnished as specified.
2. Exterior Metal Coating on Gutters, Downspouts, Gable Trim, and Eave Trim finish system, full-strength, 70 percent “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) coating.
3. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.
4. Material used in flashing and transition parts and furnished as standard by metal building system manufacturer may or may not match roof panel material.
   a. Parts: Compatible and not cause corrosive condition.

2.07 METAL ROOF SYSTEM

A. Metal Roof System: Standing Seam Metal roof system.

B. Roof System Design:
1. Design roof panels and liner panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
2. Design roof paneling system to support design live, snow, and wind loads.
3. Endwall Trim and Roof Transition Flashings: Allow roof panels to move relative to wall panels and/or parapets as roof expands and contracts with temperature changes.

C. Roof System Performance Testing:
1. UL Wind Uplift Classification Rating, UL 580: Class 90.
2. Structural Performance Under Uniform Static Air Pressure Difference: Test roof system in accordance with ASTM E 1592.
3. Roof system has been tested in accordance with U.S. Army Corps of Engineers Unified Facilities Guide Specification Section 07 61 13.

D. Roof Panels:
1. Factory roll-formed, 24 inches wide, with 2 major corrugations, 2 inches high (2-3/4 inches including seam), 24 inches on center.
2. Flat of the Panel: Cross flute 6 inches on center, perpendicular to major corrugations in entire length of panel to reduce wind noise.
3. Variable Width Panels:
   a. For roof lengths not evenly divisible by the 2'-0” panel width, factory-manufactured variable-width (9-inch, 12-inch, 15-inch, 18-inch, and 21-inch-wide) panels shall be used to ensure modular, weathertight roof installation.
   b. Minimum Length: 15 feet.
   c. Supply maximum possible panel lengths.
4. Panel Material and Finish:
   a. 24-gauge galvanized steel, G90 coating; ASTM A 653, G90.
b. Paint with exterior colors finish system, full-strength, 70 percent “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) coating.

c. PVDF Coating Warranty: Metal building system manufacturer shall warrant coating for 25 years for the following.
1) Not to peel, crack, or chip.
2) Chalking: Not to exceed ASTM D 4214, #8 rating.
3) Fading: Not more than 5 color-difference units, ASTM D 2244.

5. Panel Material and Finish: Special materials, gauges, or colors as applicable for custom designs.

6. Use panels of maximum possible lengths to minimize end laps.

7. Extend eave panels beyond structural line of sidewalls.

8. Factory punch panels at panel end to match factory-punched holes in eave structural member.


10. Panel End Laps: Locate directly over, but not fastened to, a supporting secondary roof structural member and be staggered, to avoid 4-panel lap-splice condition.


13. Ridge Assembly:

a. Design ridge assembly to allow roof panels to move lengthwise with expansion and contraction as roof panel temperature changes.

b. Factory punch parts for correct field assembly.

c. Install panel closures and interior reinforcing straps to seal panel ends at ridge.

d. Do not expose attachment fasteners on weather side.

e. Use lock seam plug to seal lock seam portion of panel.

f. High-Tensile Steel Ridge Cover: Span from panel closure to panel closure and flex as roof system expands and contracts.

E. Provision for Expansion and Contraction:

1. Provision for Thermal Expansion Movement of Roof Panels: Clips with movable tab.

a. Stainless Steel Tabs: Factory centered on roof clip to ensure full movement in either direction.

b. Maximum Force of 8 Pounds: Required to initiate tab movement.

c. Each Clip: Accommodates a minimum of 1.25-inch movement in either direction.

2. Roof: Provide for thermal expansion and contraction without detrimental effects on roof panels, with plus or minus 100-degree F temperature difference between interior structural framework of building and of roof panels.

F. Fasteners:

1. Make connections of roof panels to structural members, except at eaves, with clips with movable stainless steel tabs, seamed into standing seam side lap.

2. Fasten insulation board, bearing plates, and panel clips to structural members with “Scrubolt™” fasteners in accordance with erection drawings furnished by metal building system manufacturer, using factory-punched or field-drilled holes in structural members.

a. Fasteners: Metal-backed rubber washer to serve as torque indicator.

3. Fasteners penetrating metal membrane at the following locations do not exceed the frequency listed:

a. Basic Panel System: 0 per square foot.

b. High Eave Trim, No Parapet: 2 per linear foot.

c. Exterior Eave Gutter: 2 per linear foot.
d. Panel Splices: 2 per linear foot.

e. Gable Trim: 0 per linear foot.

f. High Eave with Parapet: 0 per linear foot.

g. Ridge: 0 per linear foot.

h. Low Eave Structural: 1.5 per linear foot.

G. Accessories:

1. Accessories (i.e., ventilators, skylights, gutters, fascia): Standard with metal building system manufacturer, unless otherwise noted and furnished as specified.

2. Metal Coating on Gutters, Downspouts, Gable Trim, and Eave Trim finish system, full-strength, 70 percent “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) coating.

3. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.

4. Material used in flashing and transition parts and furnished as standard by metal building system manufacturer may or may not match roof panel material.
   a. Parts: Compatible and not cause corrosive condition.
   b. Copper and Lead Materials: Do not use with Galvalume or optional aluminum-coated panels.

2.08 METAL WALL SYSTEM

A. Exterior Metal Wall System: Reverse-Rib, Metal Wall Panels” wall system.

B. Wall System Design: Design wall panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

C. Wall Panels:

1. Roll-formed panels, 3 feet wide with 4 major corrugations, 1-1/2 inches high, 12 inches on center, with 2 minor corrugations between each of the major corrugations entire length of panel.

2. One piece from base to building eave.

3. Upper End of Panels: Fabricate with mitered cut to match corrugations of “” roof panels of 1/2 inch to 12 inches and square cut for all other roof panels and slopes.

4. Factory punch or field drill wall panels at panel ends and match factory-punched or field-drilled holes in structural members for proper alignment.

5. Panel Material and Finish:
   a. 26-gauge painted Galvalume aluminum-zinc alloy (approximately 55 percent aluminum, 45 percent zinc), ASTM A 792.
   b. Paint with exterior colors finish system, full-strength, 70 percent “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) coating.
   c. PVDF Coating Warranty: Metal building system manufacturer shall warrant coating for 25 years for the following.
      1) Not to peel, crack, or chip.
      2) Chalking: Not to exceed ASTM D 4214, #8 rating.
      3) Fading: Not more than 5 color-difference units, ASTM D 2244.

6. Panel Material and Finish: Special materials, gauges, or colors as applicable for custom designs.

D. Fasteners:


3. Fastener Locations: Indicated on erection drawings furnished by metal building system manufacturer.
4. Exposed Fasteners: Factory painted to match wall color.

E. Accessories:
1. Accessories (i.e., doors, windows, louvers): Standard with metal building system manufacturer, unless otherwise noted and furnished as specified.
2. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.

F. Accessories:
1. Accessories (i.e., doors, windows): Design to fit wall panel system or framed openings and furnish as standard by metal building system manufacturer, unless otherwise noted.
2. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.

G. Fasteners:
1. Sub-structurals and Liner Panels: Install with self-drilling screws for attachment
2. Roof Attachment Fasteners: As specified under Roof System in this specification section.

H. Provision for Expansion and Contraction:
2. As specified under Roof System in this specification section.

I. Performance Testing: As specified under Roof System in this specification section.

2.09 METAL COATING SYSTEM

A. Substrate Preparation:

B. Coating:
1. Material: Full-strength, 70 percent, “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) color coating.
2. After steel preparation, coat exterior exposed surface with primer and PVDF
   a. Nominal Total Dry Film Thickness: 1.0 mil.
3. Interior Exposed Surfaces: Coat with polyester color coat.
4. Apply coatings to entire material dimensions of steel sheets before forming of panels.

C. Physical Characteristics of Exterior Coating:
1. Resistance to failure through cracking, checking, peeling, and loss of adhesion.
2. Measure by the following laboratory weather-simulating tests to obtain test results justifying metal building system manufacturer's 25-year warranty:
   a. Humidity resistance at 100 degrees F and 100 percent relative humidity, ASTM D 2247.
   b. Salt-spray resistance at 5 percent salt fog, ASTM B 117.
Part 3 Execution

3.01 Examination

A. Examine area to receive metal building system.

B. Notify Architect of conditions that would adversely affect installation or subsequent use.

C. Do not begin installation until unacceptable conditions are corrected.

3.02 Erection – Structural Steel Framing System

A. Erect structural steel framing system in accordance with the Drawings and metal building system manufacturer’s erection drawings.

B. Field Modifications:
   1. Require approval of metal building system manufacturer.
   2. Responsibility of building erector.
   3. Field Modifications to Truss Purlins: Not allowed, unless indicated on erection drawings furnished by metal building system manufacturer.

C. Fixed Column Bases: Grout flush with floor line after structural steel erection is complete.

3.03 Installation – Metal Roof System

A. Metal Roof System Installation: Standing Seam Metal roof system.
   1. Install roof system in accordance with metal building system manufacturer’s instructions at locations indicated on the Drawings.
   2. Install roof system weathertight.
   3. Position panel clips by matching hole in clip with factory-punched holes in secondary structural members.
   4. Position and properly align panels by matching factory-punched holes in panel end with factory-punched holes in eave structural member and by aligning panel with panel clip.
   5. Field seam panel side laps by self-propelled and portable electrical lock-seaming machine.
      a. Machine field forms the final 180 degrees of a 360-degree Pittsburgh double-lock standing seam.
      b. Factory apply side lap sealant.
   6. Panel End Laps: Minimum of 6 inches, sealed with sealant (weather sealing compound), and fastened together by clamping plates.
      a. Sealants: Contain hard nylon beads, which prevent mastic from flowing out due to clamping actions.
b. Join panel laps by 2-piece clamped connection consisting of a bottom reinforcing plate and a top panel strap.
c. Locate panel end laps directly over, but not fastened to, supporting secondary roof structural member and stagger, to avoid 4-panel lap-splice condition.

7. Minimum Blanket Insulation Thickness: 2 inches.

3.04 INSTALLATION – METAL WALL SYSTEM

A. Metal Wall System Installation: Reverse Rol” wall system.
1. Install wall system in accordance with metal building system manufacturer’s instructions at locations indicated on the Drawings.
2. Install wall system weathertight.
3. Verify structural system is plumb before wall panels are attached.
4. Align and attach wall panels in accordance with erection drawings furnished by metal building system manufacturer.
5. Install side laps with minimum of 1 full corrugation.
6. Seal wall panels at base with metal trim and foam or rubber closures.
7. Exterior Trim: Apply same finish as exterior color of wall panels, except the following:
   a. Gutters, Downspouts, Eave Trim, Gable Trim, Door-Side Flashings, and Header Flashings:
      Paint with exterior finish system, full-strength, 70 percent “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) coating in standard color of metal building system manufacturer.
8. Flashings, Trim, Closures, and Similar Items: Install as indicated on erection drawings furnished by metal building system manufacturer.

3.05 PROTECTION

A. Protect installed metal building system to ensure that, except for normal weathering, metal building system will be without damage or deterioration at time of Substantial Completion.

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Structural steel.
   2. Prefabricated building columns.

B. Related Sections:
   1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
   2. Division 05 Section "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
   3. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:
   1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches.
   2. Welded built-up members with plates thicker than 2 inches.
   3. Column base plates thicker than 2 inches.

D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
   1. Select and complete connections using AISC 360.
   2. Use either LRFD; data are given at factored-load level; or ASD; data are given at service-load level.

B. Moment Connections: At designer’s requirement.

C. Construction: Combined system of moment frame and braced frame.
Town of Sprague  
Public Works Equipment Storage Building  
Baltic Reservoir Access Road  
Sprague, Ct.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Laboratory Test Reports for Credit IEQ 4: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
   5. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer, fabricator, professional engineer, and testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.

F. Source quality-control reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, either Category ACSE, or CSE.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

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

STRUCTURAL STEEL FRAMING 051200 – Page - 2
E. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 341 and AISC 341s1.
   3. AISC 360.
   4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and relubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles, M, and S -Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M or ASTM A 572/A 572M, Grade 50.

D. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588/A 588M, Grade 50.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

F. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

G. Steel Forgings: ASTM A 668/A 668M.

H. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
   1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.

Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy hex assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Mechanically deposited zinc coating.

Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

Unheaded Anchor Rods: ASTM F 1554, Grade 55.


Nuts: ASTM A 563 hex carbon steel.

Plate Washers: ASTM A 36/A 36M carbon steel.

Washers: ASTM F 436, Type 1, hardened carbon steel.

Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

Headed Anchor Rods: ASTM F 1554, Grade 55, straight.


Plate Washers: ASTM A 36/A 36M carbon steel.

Washers: ASTM F 436, Type 1, hardened carbon steel.

Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

Threaded Rods: A 572/A 572M, Grade 50.


Washers: ASTM F 436, Type 1, hardened carbon steel.

Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.

2.3 PRIMER

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

Primer: SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.

Primer: SSPC-Paint 25 BCS, Type I, zinc oxide, alkyd, linseed oil primer.

Galvanizing Repair Paint: ASTM A 780.
GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
   4. Mark and match-mark materials for field assembly.
   5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning" or SSPC-SP 3, "Power Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

H. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened, Pretensioned, or Slip critical as specified in the metal building plans.
   2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
   2. Surfaces to be field welded.
   3. Surfaces to be high-strength bolted with slip-critical connections.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."
   3. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
   4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
   5. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
   6. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   7. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
   8. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
   9. SSPC-SP 8, "Pickling."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
   1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
   2. Galvanize lintels, shelf angles, and welded door frames attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten then Pretension anchor rods, using turn-of-the-nut, after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow curing.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened, Pretensioned, or Slip critical as specified in the metal building plans.
   2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
   3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.7 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 051200
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Integral Grade Beams and Structural Slabs Suspended Slabs poured on-grade.
   2. Building frame members.

B. Related Sections:
   1. Division 02210 Section "Site Earthwork" for drainage fill under slabs-on-grade.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Product Data for Credit IEQ 4.3: For liquid floor treatments and/or curing and sealing compounds, documentation including printed statement of VOC content.
   3. Design Mixtures for Credit ID 1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements, and for equivalent concrete mixtures that do not contain portland cement replacements.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
   1. Location of construction joints is subject to approval of the Architect and Engineer.

F. Samples: For vapor retarder.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer, & testing agency.
B. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Fiber reinforcement.
   6. Waterstops.
   7. Curing compounds.
   8. Floor and slab treatments.
  10. Adhesives.
  11. Vapor retarders.
  12. Semirigid joint filler.

C. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
   1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

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

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade I, according to ACI CP-1 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

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

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

G. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Ground contact EPS, plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.


D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

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

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.2 STEEL REINFORCEMENT

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

B. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 767/A 767M, Class II, at owner's discretion zinc coated after fabrication and bending.

C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 deformed bars, assembled with clips.

D. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

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

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
   2. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C 150, Type I, Supplement with the following:
a. Fly Ash: ASTM C 618, Class F.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.


2.5 ADMIXTURES


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

2.6 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Monofilament Micro-Fibers:
         1) Axic Italceleti Group, Inc.; Fibrasol II P.
         2) Euclid Chemical Company (The), an RPM company; Fiberstrand.
         3) FORTA Corporation; FORTA Econo-Mono.
         5) Metalcere Industries; Polystrand 1000.
         6) Nycon, Inc.; ProConM.
         7) Propex Concrete Systems Corp.; Fibermesh 150.
         8) Sika Corporation; Sika Fiber PPM.

B. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. 3M; Scotchcast Polyolefin Fibers [1"] [2"].
      b. Euclid Chemical Company (The), an RPM company; Tuf-Strand SF.
      c. FORTA Corporation; FORTA FERRO.
      e. Nycon, Inc.; XL.
      f. Propex Concrete Systems Corp.; Fibermesh 650.
      g. Sika Corporation; Sika Fiber.

2.7 WATERSTOPS

Not Applicable
A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
   b. Fortifiber Building Systems Group; Moistop Ultra 10.
   d. Insulation Solutions, Inc.; Viper VaporCheck 10.
   e. Meadows, W. R., Inc.; Perminator 10 mil.
   f. Raven Industries Inc.; Vapor Block 10.
   g. Reef Industries, Inc.; Griffolyn 10 mil Green.
   h. Stego Industries, LLC; Stego Wrap 10 mil Class A.

B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

C. Bituminous Vapor Retarder: 110-mil- thick, semiflexible, 7-ply sheet membrane consisting of reinforced core and carrier sheet with fortified asphalt layers, protective weathercoating, and removable plastic release liner. Furnish manufacturer's accessories including bonding asphalt, pointing mastics, and self-adhering joint tape.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
2. Water-Vapor Permeance: 0.00 grains/h x sq. ft. x inches Hg; ASTM E 154.
3. Tensile Strength: 140 lbf/inch; ASTM E 154.

E. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve. See the notes in the Geotechnical Report for more information.

F. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates. See the notes in the Geotechnical Report for more information.

2.9 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 4 sieve.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   b. Dayton Superior Corporation; Emery Tuff Non-Slip.
   c. Lambert Corporation; EMAG-20.
   d. L&M Construction Chemicals, Inc.; Grip It.
   e. Metalcrete Industries; Metco Anti-Skid Aggregate.

B. Slip-Resistive Aluminum Granule Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of not less than 95 percent fused aluminum-oxide granules.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   b. BASF Construction Chemicals - Building Systems; Frictex NS.
C. Emery Dry-Shake Floor Hardener: factory-packaged, dry combination of portland cement, graded emery aggregate, and plasticizing admixture; with emery aggregate consisting of no less than 60 percent of total aggregate content.
   1. Color: As selected by Architect from manufacturer's full range.

D. Metallic Dry-Shake Floor Hardener: factory-packaged, dry combination of portland cement, graded metallic aggregate, rust inhibitors, and plasticizing admixture; with metallic aggregate consisting of no less than 65 percent of total aggregate content.
   1. Color: As selected by Architect from manufacturer's full range.

E. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, and plasticizing admixture.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Construction Chemicals - Building Systems; Maximent.
      b. ChemMasters; ConColor.
      c. Conspec by Dayton Superior; Conshake 500.
      d. Dayton Superior Corporation; Quartz Tuff.
      e. Edoco by Dayton Superior; Burke Non Metallic Floor Hardener 250.
      f. Euclid Chemical Company (The), an RPM company; Surflex.
      g. Kaufman Products, Inc.; Tycron.
      h. Lambert Corporation; Colorhard.
      i. L&M Construction Chemicals, Inc.; Quartzplate FF.
      j. Metalcrete Industries; Floor Quartz.
      k. Scofield, L. M. Company; Lithochrome Color Hardener.
      l. Symons by Dayton Superior; Hard Top.

F. Pigmented Mineral Dry-Shake Floor Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Construction Chemicals - Building Systems; Mastercron.
      b. ChemMasters; ConColor.
      c. Conspec by Dayton Superior; Conshake 600 Colortone.
      d. Dayton Superior Corporation; Quartz Tuff.
      e. Edoco by Dayton Superior; Burke Non Metallic Floor Hardener 200 - 205.
      f. Euclid Chemical Company (The), an RPM company; Surflex.
      g. Kaufman Products, Inc.; Tycron.
      h. Lambert Corporation; Colorhard.
      i. L&M Construction Chemicals, Inc.; Quartz Plate FF.
      j. Metalcrete Industries; Floor Quartz.
      k. Scofield, L. M. Company; Lithochrome Color Hardener.
      l. Symons by Dayton Superior; Color Hardener.
   2. Color: As selected by Architect from manufacturer's full range.

2.10 LIQUID FLOOR TREATMENTS

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. ChemMasters; Chemisil Plus.
   b. ChemTec Int'l; ChemTec One.
   c. Conspec by Dayton Superior; Intraseal.
   d. Curecrete Distribution Inc.; Ashford Formula.
   e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
   f. Edoco by Dayton Superior; Titan Hard.
   g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
   h. Kaufman Products, Inc.; SureHard.
   i. L&M Construction Chemicals, Inc.; Seal Hard.
   j. Meadows, W. R., Inc.; LIQUI-HARD.
   k. Metalcrete Industries; Floorsaver.
   l. Nox-Crete Products Group; Duro-Nox.
   m. Symons by Dayton Superior; Buff Hard.
   n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
   o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.

C. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Advanced Floor Products; Retro-Plate 99.
      b. L&M Construction Chemicals, Inc.; FGS Hardener Plus.
      c. QuestMark, a division of CentiMark Corporation; DiamondQuest Densifying Impregnator Application.

2.11 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
      b. BASF Construction Chemicals - Building Systems; Confilm.
      c. ChemMasters; SprayFilm.
      d. Conspec by Dayton Superior; Aquafilm.
      e. Dayton Superior Corporation; Sure Film (J-74).
      f. Edoco by Dayton Superior; BurkeFilm.
      g. Euclid Chemical Company (The), an RPM company; Eucobar.
      h. Kaufman Products, Inc.; Vapor-Aid.
      i. Lambert Corporation; LAMBCO Skin.
      j. L&M Construction Chemicals, Inc.; E-CON.
      k. Meadows, W. R., Inc.; EVAPRE.
      l. Metalcrete Industries; Waterhold.
      m. Nox-Crete Products Group; MONOFILM.
      n. Sika Corporation; SikaFilm.
      o. SpecChem, LLC; Spec Film.
      p. Symons by Dayton Superior; Finishing Aid.
      q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
      r. Unitex; PRO-FILM.
      s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
   b. BASF Construction Chemicals - Building Systems; Kure 200.
   c. ChemMasters; Safe-Cure Clear.
   d. Conspec by Dayton Superior; W.B. Resin Cure.
   e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
   f. Edoco by Dayton Superior; Res X Cure WB.
   g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
   i. Lambert Corporation; AQUA KURE - CLEAR.
   j. L&M Construction Chemicals, Inc.; L&M Cure R.
   k. Meadows, W. R., Inc.; 1100-CLEAR.
   l. Nox-Crete Products Group; Resin Cure E.
   m. Right Pointe; Clear Water Resin.
   n. SpecChem, LLC; Spec Rez Clear.
   o. Symons by Dayton Superior; Resi-Chem Clear.
   p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
   q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Anti-Hydro International, Inc.; AH Clear Cure WB.
   b. BASF Construction Chemicals - Building Systems; Kure-N-Seal WB.
   c. ChemMasters; Safe-Cure & Seal 20.
   d. Conspec by Dayton Superior; Cure and Seal WB.
   e. Cresset Chemical Company; Crete-Trete 309-VOC Cure & Seal.
   f. Dayton Superior Corporation; Safe Cure and Seal (J-18).
   g. Edoco by Dayton Superior; Spartan Cote WB II.
   h. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX; Clearseal WB 150.
   j. Lambert Corporation; Glazecote Sealer-20.
   k. L&M Construction Chemicals, Inc.; Dress & Seal WB.
   m. Metalcrete Industries; Metcure.
   n. Nox-Crete Products Group; Cure & Seal 150E.
   o. Symons by Dayton Superior; Cure & Seal 18 Percent E.
   p. TK Products, Division of Sierra Corporation; TK-2519 WB.
   q. Vexcon Chemicals, Inc.; Starseal 309.

G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Construction Chemicals - Building Systems; Kure-N-Seal W.
   b. ChemMasters; Safe-Cure Clear.
   c. Conspec by Dayton Superior; High Seal.
   d. Dayton Superior Corporation; Safe Cure and Seal (J-19).
   e. Edoco by Dayton Superior; Spartan Cote WB II 20 Percent.
   f. Euclid Chemical Company (The), an RPM company; Diamond Clear VOX; Clearseal WB STD.
   g. Kaufman Products, Inc.; SureCure Emulsion.
   h. Lambert Corporation; Glazecote Sealer-20.
   i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
H. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Construction Chemicals - Building Systems; Kure-N-Seal 25 LV.
   b. ChemMasters; Spray-Cure & Seal Plus.
   c. Conspec by Dayton Superior; Sealcure 1315.
   d. Dayton Superior Corporation; Day-Chem Cure and Seal (J-22UV).
   e. Edoco by Dayton Superior; Curesel 1315.
   f. Euclid Chemical Company (The), an RPM company; Super Diamond Clear; LusterSeal 300.
   g. Kaufman Products, Inc.; Sure Cure 25.
   h. Lambert Corporation; UV Super Seal.
   i. L&M Construction Chemicals, Inc.; Lumiseal Plus.
   k. Metalcrete Industries; Seal N Kure 30.
   l. Right Pointe; Right Sheen 30.
   m. Vexcon Chemicals, Inc.; Starseal 0800.

I. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Construction Chemicals - Building Systems; Kure 1315.
   b. ChemMasters; Polyseal WB.
   c. Conspec by Dayton Superior; Sealcure 1315 WB.
   d. Edoco by Dayton Superior; Curesel 1315 WB.
   e. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300.
   g. Lambert Corporation; UV Safe Seal.
   h. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
   j. Metalcrete Industries; Metcure 30.
   k. Right Pointe; Right Sheen WB30.
   l. Symons by Dayton Superior; Cure & Seal 31 Percent E.
   m. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.

2.12 RELATED MATERIALS


B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80, or aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.

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

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
E. Reglets: Fabricate reglets of not less than 0.022-inch thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.13 REPAIR MATERIALS

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

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

2.14 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Integral Grade Beams and Structural Slabs, Poured on-Grade: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: 5000 psi at 28 days.
   3. Slump Limit: 5 inches, plus or minus 1.5 inch, unless high range plasticizer is used.
   4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
   5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

B. Building Walls: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: 4000 psi at 28 days.
   2. Maximum Water-Cementitious Materials Ratio: 0.45.
   3. Slump Limit: 5 inches, plus or minus 1 inch.
   4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

FABRICATING REINFORCEMENT

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

CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
   1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
   2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
   3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
   2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete paste.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete, per structural drawings.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

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

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.
3.5 VAPOUR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
   1. Lap joints 6 inches and seal with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

C. Granular Course: Cover vapor retarder with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.
   1. Place and compact a 1/2-inch-thick layer of fine-graded granular material over granular fill in any areas necessary.

3.6 STEEL REINFORCEMENT

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

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized steel wire ties to fasten zinc-coated steel reinforcement.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer of Record.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 2-1/2 inches into concrete.
   3. Locate joints for beams, slabs, joists, and girders at approximately one third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Structural Slabs formed on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as adjacent apron slabs.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
   2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

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

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Deposit concrete in such a manner as to avoid floatation and/or misalignment of underlying EPS foam.
   3. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
   4. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

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

3.10 FINISHING FLOORS AND SLABS

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

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
1. Apply scratch finish to surfaces indicated.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated.
D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restreighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

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

3.11 MISCELLANEOUS CONCRETE ITEMS

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

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

3.12 CONCRETE PROTECTING AND CURING

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

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

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete integral slab according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
3.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than seven days old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Polished Concrete Floor Treatment: Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
   1. Machine grind floor surfaces to receive polished finishes level and smooth.
   2. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
   3. Continue polishing with progressively finer grit diamond polishing pads to gloss level to match approved mockup.
   4. Control and dispose of waste products produced by grinding and polishing operations.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
5. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

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

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

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.

B. Inspections:
   1. Steel reinforcement placement.
   2. Verification of use of required design mixture.
   3. Concrete placement, including conveying and depositing.
   4. Curing procedures and maintenance of curing temperature.
   5. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below, and when 80 deg F and above; and one test for each composite sample.
   5. Compression Test Specimens: ASTM C 31/C 31M.
      a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
      b. Cast and field cure one set of two standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of one laboratory-cured specimen at 7 days and one set of three specimens at 28 days (hold if necessary to verify strength).
      a. Test one set of one field-cured specimen at 7 days and one set of three specimens at 28 days.
b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

10. Nondestructive Testing: Rebound (Schmidt) hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete. If rebound hammer testing is used, a core sample of the same batch type of concrete should be tested and broken in order to match the strength curves per ASTM recommendations (ASTM C805). Any coring must have location approved by the Engineer prior to execution.

11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

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

13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000
Town of Sprague
Public Works Equipment Storage Building
Baltic Reservoir Access Road
Sprague, Ct.
SECTION 31 66 13 - DUCTILE IRON PILES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Ductile Iron Piles (DIP’s), as specified herein, are an option for executing the work required by the Design Documents, foundation plans, etc. They are not the only option, and the practicability of DIP’s for this site is to be verified by the special contractor, and demonstrated in his design submittals, as described in section 1.5 herein. Care should be taken to note the obstructions, fill thicknesses, bedrock types and other information provided in the Geotechnical Report.

B. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

C. Drawings and General Provisions of the Contract, including General and Supplemental Conditions, and Division 1 Specifications, apply to the work in this specification.

D. Coordination of work between General/Site Contractor and Ductile Iron Pile Contractor affected by work of this Section. Cooperate with trades to assure the steady progress of all work under the contract.

1.2 RELATED DOCUMENTS

A. Related work specified elsewhere:
   1. Section 02 32 00- GEOTECHNICAL INVESTIGATIONS
   2. Section 31 00 00 – EARTHWORK

1.3 DESCRIPTION OF WORK

A. Work Included: Work to be done under this Section includes providing all labor, materials, supervision, equipment, transportation and services as necessary and incidental to the proper execution of the work as shown on the Drawings and specified herein.

   1. The Specialty Contractor shall select, design, furnish and install Ductile Iron Piles to provide support for the integral grade beam and slab cast on-grade, as shown on the Drawings and described in the Geotechnical Report.

   2. The design and selected capacity of the Ductile Iron Piles shall be the responsibility of the Specialty Contractor provided the following minimum design guidelines are followed:
      a. Design is in general accordance with IBC 2012 (ASCE 7-10).
      b. Design relies on subsurface information presented in the project geotechnical report.
      c. Minimum allowable design capacity of 37 kips per pile,
      d. Piles achieve acceptable performance as outlined in Article 1810.3.3.1.2 - Load Tests.
e. Piles are installed to penetrate the overlying fill and terminate in the sound ledge as needed to develop the proposed design capacity. Refer to the existing sub-surface exploration for further information.
f. Design must consider corrosion potential unless grout is used to isolate surface of pile.
g. Maximum allowable concrete/grout stress of 33 percent of specified 28-day unconfined compressive strength, up to 1,600 psi.

3. Install one (1) non-production pile for purposes of load testing to demonstrate acceptable performance. In accordance with the requirements of the applicable Building Code, perform a compression pile load test on one of the non-production piles, to a maximum test load of two (2.0) times the design capacity. Testing of the pile load test and production pile installation shall be coordinated with the Engineer’s representative.

4. Prepare and provide submittals as required herein for review by the Owner’s Representative.

5. Furnishing and installing all elements of the load reaction frame, including hold down anchors, reaction frame, and hydraulic jack.

6. Cut-off of or coordinate with General Contractor for pile stick-ups at design cut-off elevation and legally dispose or recycle pile cut-offs at approved off-site locations.

7. Coordinate with the General/Site Contractor to provide survey control, site working elevations and layout of design pile locations to complete the work.

B. Coordinate all handling and disposal of any cuttings or spoils as required to complete the Work described in this Section.

C. General Contractor is responsible for locating and protecting existing and new utilities, structures, and other facilities and site improvements during all Work. The General Contractor shall coordinate installation of new utilities with Specialty Contractor to avoid interferences with foundation construction.

D. General Contractor is responsible for excavations required during construction to remove obstructions and allow production piles to be installed. Pile installation shall continue at other nearby locations so as to reasonably continue installation and maintain schedule as the pile location(s) in question is evaluated.

E. Conduct all Work in accordance with OSHA requirements and other applicable laws and regulations, and with the requirements of all federal, state, county and local agencies and authorities having jurisdiction over the Work.

F. Obtain, pay for and comply with all required permits, licenses and approvals prior to commencing and during the Work.
1.4 QUALITY CONTROL / QUALITY ASSURANCE

A. The Specialty Contractor shall have a full-time, on-site quality control representative to verify and report all installation procedures and test results. The Specialty Contractor shall immediately report any unusual conditions encountered during installation to the Ductile Iron Pile Designer, the General Contractor and the Quality Assurance representative.

B. The Owner shall retain an independent engineering testing firm to provide Quality Assurance services in the form of on-site monitoring of Ductile Iron Pile installations. The Quality Assurance representative shall observe installation of non-production load test pile(s) and production piles as well as performance of the load testing. The Quality Assurance representative shall advise the Specialty Designer/Contractor and General Contractor in writing, if at any time, in his opinion, the work is not in substantial conformity with the plans and specifications. The Quality Assurance representative shall at no time direct the Specialty Contractor’s work.

1.5 SUBMITTALS

A. The Specialty Contractor shall submit the information specified herein to the Owner’s Representative for review and approval. Unless otherwise specified, submittals shall be made not less than two (2) weeks before the start of work.

B. All submittals specific to the design shall be prepared and stamped by a Professional Engineer licensed in the State in which the project is constructed.

C. Submittals shall include the following:

1. Detailed information on proposed type, design capacity, configuration, dimensions, materials and methods for installing the Ductile Iron Piles.

2. Experience and qualifications of Specialty Contractor and proposed personnel.

3. Written statement verifying the Specialty Contractor has successfully completed at least three (3) projects of similar size and complexity in this type of installation. Identify the name of the project, location, design consultant and owner for each project.

4. Description of the proposed pile installation equipment, materials, and procedures. Include catalog cut sheets of equipment including (but not limited to) hammers, excavators, drills, pumps, and mixing plants.

5. Detailed design calculations and drawings (the Design Submittal), for review and approval. The information shall include but not be limited to design capacities; spacing; depths; embedment in bearing stratum; locations; soil properties; element installation termination criteria and all other relevant information.
6. Description of load test location(s), equipment, procedures and load schedule. Provide shop drawings with details of load test setup including test pile, reaction system layout, hydraulic jack, telltales or strain gages, and anticipated subsurface conditions at the test pile location. Provide calibration records for the hydraulic jack to be used, prior to conducting the load test. After test completion, the Specialty Contractor shall furnish a detailed description of the test Pile installation and all test records and data, an analysis of the load test data and recommended design capacity based on the test results.

7. Cement grout or mortar mix design (if applicable) proposed for this work and strength test data for that mix by an independent testing laboratory certified by the State in which the project is constructed.

8. Daily installation records including:
   a. Project name and number.
   b. Name of Specialty Contractor.
   c. Date and time of installation (driving, grouting, etc).
   d. Pile numbers, sizes, lengths and locations of piles.
   e. Type and size of installation equipment (i.e. excavator, hammer, etc)
   f. Sequences of installation.
   g. Ground Elevation.
   h. Cut-off elevation of each pile to the nearest 0.1 foot.
   i. Rate of penetration.
   j. Volume of grout used and injection pressure (if applicable).
   k. Reinforcing steel details (bar size, length, etc) (if applicable).
   l. Depth to encounter start of bond zone (if applicable).
   m. Bond length (if applicable).
   n. Time for penetration to bond length (if applicable).

1.6 LINES, GRADES AND TOLERANCES

A. The Specialty Contractor shall coordinate with the General Contractor and Site Contractor to stake the pile locations and establish all elevations required.

B. Maximum variation of any pile from its indicated location at the cut-off elevation shall not exceed three inches (6”) unless approved by the Engineer.

C. Cut-off elevation shall be within ½-inch of elevation shown on the plans.

D. See Article 3.4 -A of this Section for remedial actions for non-conforming piles.

PART 2 - MATERIALS

2.1 MATERIALS

A. Piling materials shall consist of pre-fabricated Ductile Iron Piles utilizing high strength ductile iron pipes. The material must exhibit a yield stress for design of 45 ksi or greater and a modulus of elasticity of 24,000 ksi. Materials used in production piles shall be the same as used in the non-production test piles and those described in the Specialty Contractor submittals.
B. Grout (if applicable) shall be a mixture of Portland Cement (Type I/II), sand (if applicable) and clean, potable water proportioned and mixed to maintain solids in suspension without appreciable water gain and flowable to provide good bonding in the bearing stratum. Minimum compressive strength as required per the design of the piles but at a minimum of 3,000 psi compressive strength at 28 days. Admixtures shall be used in accordance with manufacturer’s recommendations.

C. Reinforcing Bars (if applicable) shall be a minimum Grade 60 steel, free of rust, grease, oil, dirt or other objectionable material at the time of placement.

PART 3 - EXECUTION

3.1 SEQUENCE OF OPERATIONS AND EQUIPMENT REQUIREMENTS

A. The Specialty Contractor shall provide the necessary equipment for full-time operation at the site to complete the Work.

B. The Specialty Contractor shall coordinate his activities with other Work on the site, including activities performed by the Site Contractor.

3.2 EQUIPMENT

A. Piles shall be installed with approved modern equipment. The proposed pile installation equipment and methods shall be similar as described in the approved Ductile Iron Pile Submittal, subject to approval by the Owner’s Representative.

3.3 INSTALLATION

A. The Specialty Contractor shall furnish and install all Ductile Iron Piles per the project plans and approved Ductile Iron Pile Submittal. In the event of a conflict between the project plans and the approved Ductile Iron Pile submittal, the Specialty Contractor shall not begin construction on any affected items until such conflict has been resolved.

B. Specialty Contractor shall conduct his work in a manner to insure the safety of persons and property in the vicinity of the work. The Specialty Contractor’s personnel shall comply with safety procedures in accordance with OSHA standards and any established project safety plan.

C. Piles shall be installed using high-frequency impact energy to penetrate the fill/debris and terminate in the sound crystalline bedrock as needed to develop the proposed design capacity and described in the Ductile Iron Pile Submittal.

D. For End-Bearing Ductile Iron Piles, piles shall be installed using high-frequency impact energy to achieve the required driving “set” criteria established with the non-production load test pile that meets the load test acceptance criteria or refusal of the pile. If used, grout and a steel reinforcing bar are then installed in the pipe once reaching the final depth.
For Friction Ductile Iron Piles, piles shall be installed by driving the ductile iron pile using high-frequency impact energy while continuously pumping grout to fill the annulus created by the conical grout driving shoe between the pile and the surrounding soil. The pile shall be installed to develop the minimum length and time required to drive the pile the complete bond length in the resisting layer as determined by the non-production test pile that meets the load test acceptance criteria.

Daily installation summary reports shall be provided at the end of each day to the Owner’s Representative.

3.4 NON-CONFORMING PILES

Non-conforming piles include piles that are installed out of tolerance, as specified in Article 1.6-D of this Section, are damaged, the grout tests do not indicated the specified strength had been achieved (if grouted), or the pile is not installed into the required stratum. To mitigate and/or remedy non-conforming piles, the Contractor may be required to provide additional piles or supplement piles to meet the specified requirements at no additional cost to the Owner.

3.5 COMPRESSION LOAD TESTING

A. GENERAL

1. As described in Article 1.4.A.4, the Specialty Contractor shall install a minimum of one (1) non-production piles for purposes of load testing to demonstrate acceptable performance. The pile shall be the same size and type of pile as proposed for the production piles used for the project and installed in the same manner.

2. One (1) of the non-production piles shall be successfully load tested to a maximum compression test load of twice the maximum design capacity. The test shall be performed in general accordance with ASTM D-1143, as specified herein. The maximum test load shall be twice the maximum design load.

3. The Specialty Contractor shall provide all labor, materials and equipment required to set up the load tests, and shall provide personnel at the test(s) during the entire test, to operate the hydraulic jack and all equipment necessary to vary the load increments on the test pile. The Owner’s Representative shall be notified of the test schedule to be on-site to observe the test.

B. TEST PROCEDURE

1. The Specialty Contractor is solely responsible for designing and conducting the test(s) in accordance with these specifications.

2. Allow a minimum of three (3) days for the grout to cure (if applicable).
3. Load shall be applied to the test pile by means of a hydraulic jack which reacts against a system of hold down piles, or against a loaded box or test platform, which is supported by cribbing or temporary piles. The load box or platform shall be centered on the test pile and loaded with approved material. The total dead weight or reaction above the jack and the load test support frame shall be capable of safety applying a minimum load of 37 tons.

4. The hydraulic jack shall be of an approved make with a capacity of at least 40 tons and shall be capable of providing enough stroke to load the pile to the maximum testing load without resetting the jack.

5. The top of the test pile shall be level and capped in such a manner as to produce a plane horizontal bearing surface.

6. Gages (micrometer dial indicators), each having a range of two inches and graduated to 0.001 inch divisions shall be used.

7. Micrometer dials shall be mounted to one or more steel reference beams provided by the Specialty Contractor.

C. TEST ACCEPTANCE CRITERIA

1. Ductile Iron Piles will be approved for the design load based on the greater load determined from the following criteria:
   a. Net settlement of the top of pile, after removal of all load at the completion of the test, does not exceed 0.5 inches, or
   b. Gross settlement of the pile top at the load corresponding to the design capacity does not exceed the elastic compression of the pile plus 0.15 inches plus one hundredth of the pile tip in width in inches.

2. If the allowable compression load as determined by the load test is less than the required design load, the Contractor may perform another load test at no additional cost to the Owner.

D. TEST REPORTING

1. The Specialty Contractor shall submit load test report to Owner’s Representative for review within five (5) days following completion of each test. Load test reports shall include the following:
   a. All test pile record information specified in Article 1.5.C.6 of this Section.
   b. Tabular and graphical summary of the specified load-deformation data.
   c. Brief memorandum summarizing testing procedure, test results and recommended allowable design load.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT
A. Work under this contract shall be paid as a lump sum based on the specified scope of work and shall include all design, labor, materials, and equipment required to provide and test the Ductile Iron Piles.

B. Installation of additional piles or piles deeper than the design basis because of unanticipated changes shall be paid on a unit length basis in excess of the design length.

C. Mobilization and demobilization will be measured as a lump sum per crew. The mobilization/demobilization will be measured as a single, one-time cost on the project. Additional mobilizations/demobilizations shall be paid on a unit basis.

D. Measurement for payment of static pile load tests required by the Owner’s Representative will be per test acceptably performed.

E. Stand-by time, authorized in advance by the Owner’s Representative, due to obstruction removal by others, will be measured on a per-hour basis as the time in excess of 0.5 hour per pile required to remove the obstruction.

4.2 PAYMENT

A. Specialty Contractor shall provide unit pricing for increased quantity and length of the Ductile Iron Piles.

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<th>Unit</th>
<th>Price</th>
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<tr>
<td>Furnishing and Installing Foundation Piles</td>
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<td>Additional Load Tests</td>
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HELICAL ANCHORS

Section 1 - General
1.01 Typical Installation Scope
Furnish labor, equipment, tools and material to install Helical Torque Anchors™ as described in this specification in a workmanlike manner and to design criteria. All work shall be performed in accordance with all applicable safety codes in effect at the time of installation. Only skilled, experienced workers, who are familiar with the requirements and procedures necessary to properly and safely accomplish the work outlined in this specification, shall be employed.
1. Prepare site for safe working conditions.
2. Thoroughly investigate the site for any and all underground utilities before excavating.
3. Excavate as required for installation of the product.
4. Install ECP Helical Torque Anchor™ to depth and torque specifications
5. Cut to length and install the pile cap or wall support assembly and load as required
6. Load test as required to verify design and capacity
7. Remove equipment from work area and clean work areas

1.02 Installation Plan
The torque anchors shall be installed as shown on the written repair plan that was prepared by the engineer or the installer and submitted to the owner or their representative. The plan shall include, but not be limited to:
1. Size and number of placements
2. Helical plate configuration on the helical torque anchor™
3. Spacing between helical torque anchors™
4. Minimum depth of embedment
5. Minimum target torque requirement
6. Load testing requirements

1.03 Delivery, Storage and Handling
All foundation repair products, tools and equipment shall be handled and transported with care to prevent any damage or deformation. Hydraulic components shall be protected from the weather and kept clean of any dust, dirt, mud or debris.

Section 2 - Product Material
2.01 Torque Anchors Selection
Each helical torque anchor shall be manufactured from round corner square solid steel bar or structural tubing.

2.011 Shaft Material

2.0111 Solid Square Bar
Town of Sprague
Public Works Equipment Storage Building
Baltic Reservoir Access Road
Sprague, Ct.

- 1-1/2” square bar with a torque limit of 7,000 ft-lb
- 1-3/4” square bar with a torque limit of 10,000 ft-lb
- 2-1/4” square bar with a torque limit of 23,000 ft-lb

The round corner high strength solid square bar shall conform to ASTM A29. Yield strength of the bars shall be 90,000 psi.

2.0112 Tubular Shaft
The tubular shaft shall conform to ASTM A53 with a minimum yield of 35,000 psi.

Helical Torque Anchor™ size available:
- 2-7/8” diameter x 0.203 wall thickness tubing, with a torque limit of 5,500 ft-lb

The tubular shafts shall conform to ASTM A500 with a minimum yield of 50,000 psi, or A513 Type 5 with a minimum yield of 70,000 psi.

Helical Torque Anchor™ sizes available:
- 2-7/8” diameter x 0.262 wall thickness tubing, with a torque limit of 9,500 ft-lb
- 3-1/2” diameter x 0.300 wall thickness tubing, with a torque limit of 13,000 ft-lb
- 4-1/2” diameter x 0.337 wall thickness tubing, with a torque limit of 22,000 ft-lb

2.012 Leads
Each lead section shall have a 45-degree bevel to aid in starting the helical torque anchor™. The other end shall have one or more holes to attach an Extension Sections. Leads may be 10”, 5’, 7’, or 10’ long depending upon the application.

(Limited lead configurations are available for the 2-7/8” x 0.203” product.) Welded to the Lead shall be one or more ASTM A572 Grade 50 or 80 round steel plates with specified thickness of either 3/8 or 1/2 inch, and a 3-inch helical pitch on the circumference. Helical plate diameter shall be specified in any combination of equal or increasing diameters from 6 inches to 16 inches, in 2-inch increments.

If the design calls for the pier to be filled with grout under pressure, the lead shall have 9/16-inch diameter holes at 24 inches on center for use when grouting the torque anchor.

2.013 Hot Forged Extensions
Extensions with 1-1/2” square bar, 1-3/4” square bar, 2-7/8” and 3-1/2” diameter tubing shall have hot forged integral coupling feature. The Extension may be specified as 3’, 5’, 7’ or 10’ long as required by the application. Both ends of the Extension Section shall have one or more bolt holes for attachment to a previous section of torque anchor shaft. The
opposite end of the extension shall have an expanded hot forged female receiver that will fit over the standard size shaft of an extension or lead. The hot forged extension shall be supplied with attachment hardware. In higher load capacity projects or in very weak soil conditions, the hot forge extension may have one or more ASTM A572 Grade 80 round steel helical plates with specified thickness of either 3/8 or 1/2 inch, and a 3-inch helical pitch on the circumference. Helical plate diameter shall be specified in any combination of equal or increasing diameters from 6 inches to 16 inches, in 2-inch increments.

2.014 Coupled Extensions

2.0141 2-1/4” Square Bar Coupled Extensions
Extensions fabricated from 2-1/4” round corner solid square bar shall use a separate mechanical coupler. The Extension may be specified as 3’, 5’, 7’ or 10’ long as required by the application. Both ends of the Extension shall have two 1-1/8” diameter bolt holes for attachment to a previous section of torque anchor shaft. Each extension shall be supplied with a coupler fabricated from class 90/60 grade SC8630 steel casting. Each coupler shall have four holes that match to the extension and shall be supplied with 1” diameter attachment hardware.

2.0142 Tubular Coupled Extensions
Extensions fabricated from 3-1/2” diameter x 0.300 wall tubing or 4-1/2” diameter x 0.337” thick wall tubing shall use a separate mechanical coupler. The Extension may be specified as 3’, 5’, 7’ or 10’ long as required by the application. Both ends of the Extension shall have bolt holes for attachment to a previous section of torque anchor shaft. Each extension shall be supplied with a coupler fabricated from 2-3/4” diameter x 0.375” thick wall tubing or 3-5/8” diameter x 0.375 wall tubing conforming to ASTM A513. Each coupler shall have attachment holes that match to the extension and shall be supplied with hardware.

2.015 Attachment Hardware
Each extension shall be supplied with the appropriate quantity of SAE J429 Grade 8 bolts and nuts having a minimum ultimate tensile strength of 150,000 psi and a minimum yield of 130,000 psi. Bolt lengths range from 3” to 5-1/2”.

2.02 Torque Anchor™ Termination
**2.021 Pile Cap Assembly**
Depending upon the application, the pile cap assembly shall be a welded assembly consisting of a steel plate welded to a steel tube of suitable size to fit the torque anchor shaft and shall be retained by gravity. The designer shall specify the plate size for the top of the pile cap. If the foundation will be subjected to uplifting forces, the pile cap assembly must be specified as an uplift application. The pile cap assemblies that shall be used in tension applications shall be supplied with attachment holes and attachment hardware as described in 2.014.

**2.022 Transition (Tieback and Other Tension Applications)**
The transition is a component that attaches to one end the helical torque anchor™ and the other end has a threaded socket to accept an all-thread bar or a bolt.

**2.0221 1-1/2” Square Bar Light Duty Transitions**
The square bar transition is a welded assembly 3/8” or 1/2” thick steel plates. The plates are welded together to fit over the solid square torque anchor shaft. The other end of the transition shall have a captive welded nut of suitable size and strength to match the specified attachment hardware or design load.

**2.0222 Hot Forged Extensions**
Square bar transitions for 1-1/2” square bar and 1-3/4” square bar shall have hot forged integral coupling feature. The forged end of the transition shall have one bolt hole for attachment to the final section of torque anchor shaft. The opposite end of the transition shall have a threaded hole that will accept a continuously threaded shaft. The thread shall be sized to accept Williams Form WF-8 or WF-10 bars depending upon the torque anchor shaft size.

**2.0223 Tubular Transition**
The tubular shaft transition is a welded assembly of tubular sleeves and 3/8” to 3/4” thick steel plates. The plates are welded to a sleeve designed to fit over or inside the tubular anchor shaft and secured with two SAE J429 grade 8 bolts and nuts. The one end of the transition shall have a captive welded nut of suitable size and strength to match the specified attachment hardware or design load.

**2.03 Pressure Grout (Optional)**
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2.04 Weldments
All welded connections shall conform to the requirements of the American Welding Society, “Structural Welding Code AWS.01.1” and applicable revisions.

2.05 Corrosion Protection
ECP Torque Anchors™ shall be supplied with hot dipped zinc galvanized corrosion protection per ASTM A123 Grade 100 and applicable revisions.

Section 3 – Tools and Equipment
3.01 Hydraulic Gear Motor
A hydraulic gear motor is required to install the helical torque anchor™ to the desired torque and depth. The capacity of the gear motor generally will range between 2,000 to 30,000 foot-pounds, depending upon the soil conditions and torque anchor configuration and shall be fully reversible. The installation torque rating of the hydraulic gear motor shall be at least 25 percent higher than the planned installation torque. Rotation shall range between 5 and 20 revolutions per minute.

3.02 Torque Monitoring Device
The installation torque applied to the helical torque anchor™ shall be monitored continuously during installation. The torque monitoring device may be a part of the installing unit or may be a device in line with the hydraulics. Accuracy of the torque monitoring device shall be insured by having calibration data available for review by the engineer or the owner’s representative.

3.03 Tooling
The hydraulic torque motor must be firmly mounted to machinery capable of positioning the torque anchor at the proper angle and capable of providing proper installation force (crowd) to advance the torque anchor. Adapters used to connect the motor to the helical torque anchor™ shall have a capacity exceeding the torque required to install the anchor and shall be mechanically connected to the anchor during installation.

The Pressure Grouting material shall be a non-shrink grout suitable for pumping into the tubular helical torque anchor. A minimum 3-day compressive strength of 3,000 PSI is required.
3.04 Hand Pump – HYD-801
The hand pump assembly shall provide two stages of displacement at pressures up to 10,000 psi. Below 400 psi the displacement shall be 2.4 in³ per stroke and above 400 psi, 0.15 in³. (Enerpac P-801 or equal)

3.05 Pressure Gauges – HYD-2535
A pressure gauge shall be provided to monitor the lifting force applied to the structure during restoration. The pressure gauge shall be capable of measuring 0 – 10,000 psi with a minimum gauge face of 2-1/2” and minor graduations of 200 psi. (Enerpac G2535L or equal)

3.06 Single Acting Hollow Plunger Hydraulic Ram
A single acting hydraulic Ram shall be used during the load transfer phase when performing a axial compression load test. If the project requires a tension load test then the hydraulic ram must have a center hole to accept the threaded bar connected to the pile. The hydraulic cylinder shall be rated at 10,000 psi of hydraulic pressure and have heavy duty return spring. The capacity and stroke of the cylinder shall be determined by the application.

Section 4 – Helical Torque Anchor™ Installation
The following specification contains the major steps to be undertaken to install helical torque anchors™. Variations may occur depending upon the application and the type of structural support required.

Warnings!
Utilities: Thoroughly investigate the job site for the possible existence and location of all underground utilities before proceeding. Avoid all contact with ALL underground utilities!
Excavations: Collapsing soil can be dangerous. Follow OSHA requirements at all times. Do not enter any excavation if there are any questions about the stability of the soil.
Hazardous Machinery: The use and operation of hydraulic gear motors can be very hazardous due to the power of the motor. The torsional forces developed during operation can be extreme resulting in breakage of product and equipment. The transfer of these forces may be extremely quick leaving little or no time for personnel to react and/or avoid contact. Under no circumstances should the equipment be operated without proper training in procedures and knowledge of product capabilities. Do not allow observers close to the equipment during operation.
Reaction Bar: An unmovable object must used when restraining a reaction bar. The reaction bar must be firmly secured against movements in all directions. Never stand close to or on a reaction bar during installation.
Heavy Lifting: Many pieces of equipment used to install steel foundation underpinning are very heavy. Use proper lifting techniques, back supports, and help from others when lifting heavy objects.

Warning!

4.01 Torque Anchor™ Installation
The hydraulic installation motor shall be installed to portable equipment or to a suitable machine capable providing the proper installation angle, reaction against installation torque, and downward force (crowd). The lead section shall be positioned with the shaft adjacent to the stem wall at the designated location. The opposite end shall be attached to the hydraulic installation motor with a pin(s) and retaining clip(s).

If using portable equipment, the torque reaction bar MUST be properly secured against movements in all directions. Torque Anchor™ lead sections shall be placed at the locations indicated on the plans. The lead section shall be advanced into the soil in a smooth and continuous manner using sufficient down pressure for uniform advancement. The installer shall have knowledge of the desired pressure differential that will produce the desired terminal installation torque approved by the engineer before beginning the installation.

Once the lead is installed, the motor shall be unpinned from the lead. One or more extensions shall be installed and securely bolted in place with the hardware supplied by the manufacturer.

- The hot forged coupling on the 1-1/2” solid square shaft, the 1-3/4” solid square shaft, 2-7/8” and 3-1/2” diameter tubular sections shall be placed over the top of the previous section of torque anchor™ and secured with the high strength bolt(s) and nut(s) supplied by the manufacturer.

- The 2-1/4” solid shaft, 3-1/2” diameter x 0.300 wall thickness and 4-1/2” diameter x 0.337 wall tubular products are connected with a separate coupler. The coupler either fits over the solid shaft and secured with four high strength bolts and nuts or within the tubular section and shall be secured using four or six high strength bolts and nuts.

Hardware shall be supplied by the manufacturer to match the product. The torque anchor™ shall be continue to be driven to the average design torque until the bottom end of the torque anchor™ is at the design depth. Once the design torque at the design depth has been achieved, the installation motor shall be removed from the torque anchor™.
4.02 Installation Requirements

4.021 The minimum average installation torque and the minimum length shown on the plans shall be satisfied prior to termination the installation. The installation torque shall be an average of the installation torques recorded during a minimum of the last three feet of installation.

4.022 The torsional strength rating of the torque anchor™ shall not be exceeded during installation. If the torsional strength limit for the torque anchor™ has been reached, but the anchor has not reached the target depth, do the following:

4.0221 If the torsional strength limit is achieved prior to reaching the target depth, the installation may be acceptable if reviewed and approved by the engineer and/or owner.

4.0222 The installer may remove the torque anchor™ and install a new one with fewer and/or smaller diameter helical plates with the review and approval by the engineer and/or owner.

4.023 If the target is achieved, but the torsional requirement has not been met; the installer may do one of the following subject to the review and approval of the engineer and/or owner:

4.0231 Install the torque anchor™deeper to obtain the required installation torsion.

4.0232 The installer may remove the torque anchor™ and install a new one with an additional helical plate and/or larger diameter helical plates.

4.0233 Reduce the load capacity of the placement and provide additional helical torque anchors™ to achieve the required total support for the project.

4.024 If the torque anchor™ hits an obstruction or is deflected from its intended path, the installation shall be terminated and the anchor removed. Either the obstruction must be removed or the torque anchor™ relocated as directed by the engineer and/or owner.

FAILURE TO HEED THESE WARNINGS, OR TO FOLLOW SAFE WORK HABITS, OR IMPROPER USE OF THE EQUIPMENT AND MATERIALS MAY RESULT IN LIFE THREATENING SITUATIONS, BODILY INJURY AND/OR PROPERTY DAMAGE!
4.025 In no case shall a torque anchor™ be backed out and reinstalled to the same depth. If an anchor must be removed for any reason, it must be installed a minimum of three feet farther.

4.03 Torque Anchor™ Length Adjustment
After meeting the installation requirements, the installer may remove the final plain extension section and replace it with a shorter one to obtain the design elevation, or he may cut the extension to length. The cut shall be smooth and at 90 degrees to the axis of the shaft. It is not permissible to reverse the installation to reach the desired coupling elevation.

4.04 Load Testing
The engineer and/or owner shall determine if a load test is required, the number of load tests required, locations for the test(s) and acceptable load and movement criteria. The load test(s) shall be in general conformance with ASTM D-1143.

4.041 Equipment
The load test equipment shall be capable of imposing incrementally increasing and decreasing loads on the test anchor. The reaction frame shall have sufficient rigidity and strength to minimize movements under load and prevent imposing an eccentric load to the test anchor. The test components shall also be assembled to minimize any eccentric loading. The hydraulic jack shall be capable of exerting at least twice the anticipated design load and have a stroke longer than the anticipated movement during the test. Pressure gauges shall be calibrated in 100 psi increments or less. Dial indicators with an accuracy of +/- 0.001” or a sight level and an engraved steel scale with increments of 1/64” or less may be used subject to engineer and/or owner approval. All equipment used for load testing shall have been calibrated within one year of the test and subject to retest at the request of the engineer and/or owner if there is any concern or doubt about the accuracy of any component.

4.042 Procedure

4.0421 Alignment Load
An alignment load of no more than 10 percent of the design load shall be applied to the torque anchor™ prior to setting the deflection measuring equipment to zero or to the reference elevation. Once complete, the apparatus shall be checked for alignment and safety.
4.0422 Incremental Load Test
Axial load test either in tension or compression shall be conducted in an incremental fashion. The increments shall be 20 percent of the design load or as specified by the engineer and/or owner. Movement of the end of the anchor shall be recorded at the beginning of each increment and after time intervals. Recommended intervals are 1/2 minute, 1 minutes, 5 minutes, 10 minutes and 20 minutes. The monitoring may be stopped if the recorded movement is less than 0.002” per minute measured over a minimum of 5 minutes.

4.0423 Test Termination
Load test increments shall continue to be applied until continuous jacking is required to maintain the load increment, the load equals 200 percent of the design load or if the deflection exceeds the criterion established by the engineer and/or owner prior to running the test.

4.0424 Unloading
The applied axial test load shall be removed in two or three approximately equal decrements. The hold time for each decrement shall be one minute except the final decrement, which shall equal the alignment load. This load shall be held for 5 minutes.

4.0425 Documentation
The field test data shall be collected and compiled into an easy to read report and submitted to the engineer and/or owner for review and approval.

4.05 Documentation
The installer shall carefully monitor the torque applied to the anchor as it is installed. It is recommended that the installation torque be recorded at one foot intervals, but should never exceed every two feet. The data may be collected from electronic torsion monitoring equipment that has been calibrated to the installation motor being used. Installation torque may also be monitored by noting the differential pressure across the installation motor and determining the torque from the manufacturer’s published torque curves.
At the conclusion of the installation, the raw field data shall be converted into an installation report that includes the location of each placement, the installation depth, and the averaged installation torque over the final three feet.
4.06 Torque Anchor™ Termination

4.061 Pile Cap
The pile cap, slab pier bracket, utility bracket, or porch bracket shall be installed by placing the appropriate sleeve over the torque anchor™ shaft. If the foundation will be subjected to uplift the pile cap shall be bolted to the torque anchor using bolt(s) and nut(s) supplied by the manufacturer having the same size and strength as used to couple the pile sections.

4.062 Transition
The transition is sometimes used for equipment anchorage. The transition shall be bolted to the end of the torque anchor™ using the hardware supplied by the manufacturer. All threaded bar is attached between the transition and the equipment base. If required, the installer may place a center hole ram over the continuously threaded bars to preload pile in tension as specified. The mounting nuts shall then be tightened securely to maintain the preload. In less critical applications the wall plate nuts may be tightened to a torque specified by the engineer or owner.

4.07 Cleanup
Remove all scrap and other construction debris from the site. Remove all tools and equipment, clean them and store them. Any disturbed soils in the area of work shall be restored to the dimensions and condition specified by the engineer and/or owner. Dispose of all construction is a safe and legal manner.
PART 1 GENERAL

1.1 WORK INCLUDED

A. Demolition & removals as noted, indicated and or required.

B. Complete Monoxide Detection and Control System.

C. Wall Louvers and Dampers.

D. Power wall Exhaust Fans

E. Heated Monoxide Controller Cabinet

F. Electrical Wiring, Panel, Breaker, Conduit, etc.

G. Visual and available alarms

H. Monoxide Detection / Evaluation System

1.2 RELATED WORK

A. Shop drawings and product data

B. Testing, adjusting and balancing

C. Final cleaning and removals

D. Operation and maintenance data

E. Project record documents

F. Contract Closeout

G. Insulation of existing steam and condensate piping in boiler room

H. Insulation of all new steam, condensate, water and heating hot water supply and return piping.

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1.3 REFERENCE STANDARDS

A. International Mechanical and Plumbing Code
B. Connecticut State Building Code
C. Connecticut State Fire Safety Code
D. National Fire Protection Association (NFPA) Standards
E. American National Standards Institute (ANSI) Standards
F. American Society of Mechanical Engineers (ASME) Standards
G. American Society for Testing and Materials (ASTM) Standards
H. American Water Works Association (AWWA) Standards
I. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standards
J. Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Standards

1.4 DEFINITIONS

A. “Piping” includes, in addition to pipe, all fittings, valves, hangers, and other accessories relating to such piping.
B. “Concealed” means hidden from sight in trenches, chases, furred spaces, shafts, hung ceilings, embedded in construction or in crawl spaces.
C. “Exposed” means not installed underground or “concealed” as defined above.
D. “Provide” means furnish and install complete and ready to operate.
E. “Engineer” means Frank Zaino & Associates, Inc. or their authorized representative.

1.5 SHOP DRAWINGS AND PRODUCT DATA

A. SUBMITTALS: Submit shop drawings, manufacturers data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication, or delivery of the items to the job site. Particular submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer’s name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable Federal, Military, industry, and technical society publication references, and other information necessary to
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establish contract compliance of each item the Contractor propose to furnish.

B. INTENT: It is the intent of the plans and these specifications that all equipment, materials and workmanship used on this project be in complete conformance with all local, state and national codes and all other applicable governmental regulations, codes or standards such as NFPA, ASME, SMACNA, ASHRAE and the National Mechanical Code. It is the contractor's responsibility to submit only those items that meet these codes and standards. Should an item be inadvertently specified by model number that is not in conformance with these codes and standards, the contractor shall notify the proper authorities prior to any submittals of this item. Regardless of any approval action given, it is the contractor's responsibility to install only those items that are in conformance with the codes and standards. Should any non-conformance items be installed, they shall be replaced by the contractor at no additional cost to the owner.

1.6 PERMITS
A. Obtain all required permits and pay all fees.
B. Provide to Engineer, in duplicate, a certificate of final inspection from the authority having jurisdiction for each system.

1.7 INSPECTIONS AND TESTS
A. During the progress of the work it shall be subject to the inspection of the Owner and to such other inspectors as may have jurisdiction.
B. At completion of the work, Contractor shall submit to the Owner's representative in writing a statement stating: (1) that the work is complete; (2) that the entire installation is in accordance with the drawings and specification; (3) that preliminary tests have been made; and (4) that the work is ready for final inspection and test.
C. A final inspection of the installation to determine compliance with the drawing and specifications will be made by the Owner's representative. Work will be checked for quality of materials, quality of workmanship, proper installation and finished appearance. This Contractor shall provide the services of the project foreman for inspection purposes. The foreman shall remove and reinstall access panels, ceiling tiles, etc., as required to facilitate any inspections required by the Owner's representative.
D. The Contractor shall arrange and conduct operating tests on all equipment in the presence of the Owner's representative. The component parts of systems and the various systems shall be demonstrated to operate in accordance with the requirements and intent of this specification. Any non-complying or defective materials or workmanship disclosed as a result of the inspection and tests shall be corrected promptly by the Contractor, and the tests repeated as often as necessary until approved and accepted by the Owner's representative.

1.8 DRAWINGS
A. The drawings show the layout of the mechanical systems and indicate the approximate locations of duct, piping, apparatus, and equipment. The runs of duct and piping as shown on the drawings are
schematic only. The exact routing of ducts and piping shall be determined by the structural conditions and possible obstructions. This shall not be construed to mean that the design of the systems may be changed, but refers only to exact runs between given points. The Engineer reserves the right to revise the drawings from time to time to indicate changes in the work.

B. The Contractor shall consult and review all contract and reference drawings which may affect the location of terminal units, apparatus and equipment to avoid any possible interference and permit full coordination of all work. The right to make any reasonable change in location of terminal units, apparatus and equipment up to the time of rough-in is reserved by the Engineer and such change shall be made without additional expense to the Owner.

C. It shall be the responsibility of this Contractor to see that all mechanical equipment and apparatus as may require maintenance and operation from time to time is made readily accessible. Although the equipment may be shown on the drawings in certain locations, the construction may disclose the fact that such locations do not make its position readily accessible. In such cases this Contractor shall call the attention of the Engineer to the condition before advancing the construction to a state where a change will reflect additional expense to the Owner.

1.9 MANUFACTURER’S IDENTIFICATION

A. Manufacturer’s nameplates or trademark shall be permanently affixed to all equipment and materials furnished under this specification. The nameplate of a subcontractor or distributor is not acceptable.

1.10 LABOR

A. Provide all transportation, freight, loading and unloading and provide all labor necessary for erecting in place of all material and equipment shown, specified or required under this Division.

1.11 UTILITIES

A. Provide all utilities such as water, fuel and electricity for all tests associated with or specified by this Division.

1.12 FIREPROOFING

A. All clips, hangers, clamps, supports and other attachments to the fire rated structure shall be coordinated with other trades in order to avoid any damage to the fireproofing.

B. All conduit and other items which would interfere with the proper application of fireproofing shall be installed after the application of fireproofing work.

1.13 PORTABLE OR DETACHABLE PARTS

A. This contractor shall retain in his possession and shall be responsible for all portable and/or
detachable parts and portions of the installation and all other devices or materials that are relative to and necessary for the proper operation and maintenance of the systems until final completion of the work.

B. Replace all stolen, lost or damaged items relative to the installation and operation of the systems before the building is accepted by the Owner.

1.14 TEMPORARY HEAT

A. All temporary heat shall be provided by this Contractor. Temporary heat shall not be provided from the permanent heating system unless specific permission is given by the Architect. The contractor shall be responsible for any damage from such use of the permanent heating system without permission of the Architect.

1.15 REMOVAL OF RUBISH

A. The Contractor shall keep the building and site clean from his own rubbish and/or waste materials and, upon completion of his contract, shall leave the building, site and installation in a clean condition completely acceptable to the Owner’s Representative.

1.16 SAFETY PRECAUTIONS

A. Comply with all of the safety requirements of OSHA throughout the entire construction period of the project.

B. Furnish, place and maintain proper guards for prevention of accidents and any other necessary construction required to secure safety of life and/or property.

1.17 SURVEYS AND MEASUREMENTS

A. This contractor shall base his measurements, both horizontal and vertical, from referenced points established by the General Contractor and shall be responsible for correct laying out of his work.

B. In the event of discrepancy between actual measurements and those indicated, notify the General Contractor in writing and do not proceed with this work until written instructions have been issued by the General Contractor.

1.18 ACCESS DOORS

A. The Contractor shall provide access doors of size as required for access to valves, vents, dampers and other mechanical equipment. Doors shall be compatible with architectural treatment and materials and shall be submitted to the Architect for approval. Where existing valves or equipment have been concealed by ceilings or walls the plumbing, mechanical and/or fire protection contractor shall install new access doors.
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1.19 OPENINGS IN EXTERIOR WALLS OR ROOF

A. Openings in exterior walls or roof shall be kept properly plugged and caulked at all times, except when being worked on to preclude the possibility of flooding due to storm or other causes. After completion of work, openings shall be permanently sealed and caulked in a manner approved by the Engineer or Architect.

1.20 GUARANTEE

A. Except as otherwise specified, all work, materials and equipment shall be guaranteed against defects resulting from the use of inferior materials, equipment, or workmanship for one year from the date of final completion of the contract, and/or from full acceptance by the Owner.

B. If, within any guarantee period, repairs or changes to guaranteed work are required as a result of the use of defective materials or equipment, inferior workmanship or work that is not in accordance with the terms of the contract, and upon receipt of notice from the Owner, the following shall be done without expense to the Owner:

1. Place in satisfactory condition in every particular all of such guaranteed work and correct all defects therein.

2. Repair all damage to the building or site/equipment or contents thereof which is the result of the use of defective materials or equipment or inferior workmanship, or of work not in accordance with the terms of the contract.

3. Make good any work or materials, or the equipment and contents of said building or site disturbed in fulfilling any such guarantee.

C. In fulfilling the requirements of the contract or of any guarantee embraced in or required thereby, any work guaranteed under another contract is disturbed, restore such disturbed work to original condition and guarantee such restored work to the same extent as it was guaranteed under such other contract.

D. If upon failure to proceed promptly after notice to comply with the terms of the guarantee, the Owner may have the defects corrected and Contractor and his surety shall be liable for all expenses incurred.

1.21 CLEANING OF SYSTEM

A. Thoroughly clean piping, ducts fixtures and equipment of all foreign substances inside and out before placing in operation.

B. If any part of a system should be stopped by any foreign matter after being placed in operation, clean and reconnect system.
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C. Remove all covers of interior floor drains and cleanouts, clean of all dirt, concrete traces, etc., then lightly grease and reinstall.

1.22 TEMPORARY OPENINGS

A. Coordinate construction and provide temporary openings in the building as required for the admission of equipment furnished under this Division.

1.23 EQUIPMENT DEVIATIONS

A. Where proposals to use an item of equipment other than that specified or detailed on the drawing which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Contractor at his own expense and approved by the Engineer.

B. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the drawings, furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

C. All equipment furnished by the Contractor shall fit into the spaces indicated on the drawings with all required and indicated clearances. Equipment not complying with this requirement, whether or not matching required capacities, shall not be approved. Final determination shall be by the Engineer.

1.24 COOPERATION WITH OTHER TRADES

A. Give full cooperation to other trades and furnish in writing to the Engineer any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. Where the work will be installed in closed proximity to, or will interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment. Prepare composite working drawings and sections at a suitable scale not less than 1/4 inch = 1 foot 0 inches, clearly showing how work is to be installed in relation to the work of other trades. If the work is installed before coordinating with other trades, or so as to cause any interference with work of other trades, necessary changes in the work shall be made to correct the conditions without extra charge.

1. Prior to submission of coordination drawings, check with approved equipment shop drawings to ascertain that they comply with the Contract requirements; that the Mechanical and Electrical characteristics are correct; and that the dimensions of work submitted fit the available space. Any deviations from the Contract requirements shall not be acceptable without prior approval from the Architect/Engineer.

C. Furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.25 PROTECTION
A. Protect all work and material from damage by work and workmen, and accept liability for all damage thus caused.

B. Be responsible for work and equipment until finally inspected, tested, and accepted. Protect work against theft, injury or damage; and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

1.26 SCAFFOLDING, RIGGING AND HOISTING

A. Provide scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of material, equipment and apparatus furnished under this division. Remove same from premises upon completion of work.

1.27 MATERIALS AND WORKMANSHIP

A. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Engineer shall be furnished.

B. Furnish the services of an experienced foreman who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welder, helpers, and labor required to unload, transfer, erect, connect adjust, start, operate, and test each system.

1.28 QUIET OPERATION AND VIBRATION

A. Work shall operate under all conditions of load without any objectionable sound or vibration. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable shall be corrected in an approved manner at no expense to the Owner. Vibration control shall be means of approved vibration eliminators in a manner as recommended by the manufacturer of the eliminators.

1.29 ACCESSIBILITY

A. Assure and be responsible for the adequacy of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of the work. Cooperate with all other trades whose work is in the same space. Such spaces and clearances shall, however, be kept to the minimum size required.

B. Locate all equipment which must be serviced, operated, adjusted or maintained in fully accessible positions. Equipment shall include, but not be limited to, valves, traps, cleanouts, motors, controllers, filters, dampers, starters, coils, fire dampers, drain points, etc. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility, and any change must be approved by the Engineer. This requirement shall apply to all new and existing components. If an existing valve or piece of existing mechanical equipment becomes inaccessible due to new construction, the associated contractor shall be responsible to provide an access door for this valve and/or piece of equipment.

C. Provide access panels for installation in concrete block walls or gypsum wallboard ceilings and partitions in locations which require access for service to the items located behind the permanent gypsum wallboard or concrete block finish.

D. Access panels shall be installed where required to gain access to valves, dampers, controls, etc. Panels shall be flush, insulated, contain continuous steel hinge and screwdriver operated latch. Panels shall be rated equal to the assembly that they are being installed in panels shall be UL
listed. This requirement shall apply to all new and existing components. If an existing valve or piece of existing mechanical equipment becomes inaccessible due to new construction, the associated contractor shall be responsible to provide an access door for this valve and/or piece of equipment.

E. Access panels located in fire rated partitions shall be fire panels. The frame and panel assembly of these fire panels shall be manufactured under the Factory Inspection Service of the Underwriters' Laboratories, Inc., and shall bear a label reading: "Frame and Fire Panel Assembly, Rating 2 hours. (B) Temperature Rise 30 Minutes, 250°F. Maximum." Rated panels shall be equipped with automatic closing mechanism and be self latching.

F. Panels shall be provided with screwdriver operated flush cam locks.

G. Panel size shall be 12 inches x 12 inches except furnish a larger size if required to service a particular item. The exact location and size of each access panel shall be reviewed with, and approved by, the Engineer.

1.30 FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

A. Provide all necessary foundations, supports, pads, bases and piers required for all equipment, piping, boiler, pumps, tanks, and for all other equipment furnished under this contract. Submit shop drawings to the Engineer for approval before purchase, fabrication or construction of same.

B. Provide concrete pads with reinforcing for all rotating machinery and for all equipment where foundations are indicated. Pads shall extend six (6) inches beyond machine base in all directions with top edge chamfered. Inset 6-inch steel dowel rods into floors to anchor pads.

C. Construction of foundations, supports, pads, bases, and piers where mounted on the floor, shall be of the same quality and finish as the adjacent and surrounding floor material.

D. All equipment, unless shown otherwise, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are not strong enough shall be replaced as directed.

1.31 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

A. Furnish and install all supplementary steel, channels and supports required for the proper installation, mounting and support of all equipment.

B. Supplementary steel and channels shall be firmly connected to building construction in a manner approved by the Architect/Engineer, as shown on the drawings or hereinafter specified.

C. The type and size of the supporting channels and supplementary steel shall be determined by the installer and shall be of sufficient strength and size to allow only a minimum of deflection in conformance with the manufacturer requirements for loading.

D. All supplementary steel and channels shall be installed in a neat workmanlike manner parallel to the walls, floor and ceiling construction. All turns shall be made with 90 deg. and 45 deg. fittings, as required to suit the construction and installation conditions.

E. All supplementary steel, channels, supports and fittings shall be galvanized steel as manufactured by Unistrut.

F. This Contractor shall check all structural steel drawings, and structural steel specifications so as to determine what steel will be required of him prior to submitting bid. Failure to do so shall be the total responsibility of this Contractor.

G. All equipment, unless shown otherwise, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are not strong enough shall be replaced as directed.
1.32 CUTTING AND PATCHING
   A. Provide all cutting and patching necessary to install the work specified in this division. Patching shall match adjacent surfaces.
   B. No structural members shall be cut without the approval of the Engineer, and all such cutting shall be accomplished in a manner directed by the Engineer.

1.33 WATERPROOFING
   A. Where any work pierces waterproofing, including walls, roof and waterproof concrete, the method of installation shall be as approved by the Engineer before work is started. Furnish all necessary sleeves required.

1.34 ELECTRICAL WORK
   A. All Electrical work shall be included and as specified under Division 16.
   B. Upon completion of temperature control system wiring, the responsibility of the control system will fall under Division 15. Responsibility for all power wiring will remain in Division 16.

1.35 ELECTRIC MOTORS
   A. Electric motors and starters shall conform to requirements of the AIEE, NEMA, UL, NEC and shall be suitable for load duty, voltage, phase, frequency, service and location required.
   B. Motors shall be suitable for continuous duty at rated horsepower with temperature rise not to exceed 65 degrees C. for drip proof motors, 65 degrees C. for splashproof motors and 90 degrees C. for totally enclosed or explosions proof motors, above an ambient temperature of 40 degrees C. Totally enclosed motors shall have a service factor of 115 percent.
   C. Motors 3/4 HP and larger shall have ball or roller bearings with pressure grease lubrication.
   D. Motors shall be provided with conduit terminal box, adequate starting and protective equipment as specified or required. The capacity shall be sufficient to operate associate driven devices under all conditions of operation and load and without overload, and at least horsepower indicated or specified. Each motor shall be selected for quiet operation.
   E. Direct connected motors shall be furnished without an adjustable base. Motors connected to driven equipment by belt or chain shall be furnished with adjustable sliding base, except fractional motors with slotted mounting holes.
   F. Motor leads shall be permanently identified and supplied with connectors, and shall be protected from air flow in the case of equipment with direct connected motors, i.e. fans, etc.
   G. Motors shall have nameplates giving manufacturer's name, serial number, horsepower, speed and current characteristics and shall be as manufactured by Westinghouse Electric Corporation, General Electric Company, or Louis Allis Company.
   H. Motors smaller than 3/4 HP shall be capacitor-start or split phase type single phase, 60 hertz alternating current for voltage required. Motors 3/4 HP and larger shall be squirrel-cage induction three phase 60 hertz alternating current for voltage required, unless specifically noted otherwise.

1.36 BIDDER'S REPRESENTATION
   A. By the act of submitting a bid for the proposed contract, the Bidder represents that:
      1. The Bidder and all subcontractors to the Bidder intends to use have carefully and thoroughly reviewed the drawings, specifications and other construction contract documents and have found them complete and free from ambiguities and sufficient for the purpose intended; further that,
2. The Bidder and all workmen, employees and subcontractors the Bidder intends to use are skilled and experienced in the type of construction represented by the construction contract documents bid upon; further that,

3. Neither the bidder nor any of the Bidder's employees, agents, intended suppliers or subcontractors have relied upon any verbal representations, allegedly authorized or unauthorized from the Owner, or the Owner's employees or agents including architects, engineers or consultants, in assembling the bid figure; and further that, the bid figure is based solely upon the construction contract documents and properly issued written addenda and not upon any other written representation.

PART 2 PRODUCTS
2.01 IDENTIFICATION, MARKING AND TAGGING

A. Systems and equipment to be identified and marked and valves tagged include, but are not limited to:
   1. Plumbing Systems
   2. Boilers and pumps
   3. Heating, Ventilating and Air Conditioning Systems
   4. Mechanical Room Ductwork
   5. Mechanical Room Piping Systems
   6. Fuel Piping Systems

B. Submit samples of marking and tagging devices and wording, lettering and numbering scheme for each system.

C. Preparation
   1. Degrease and clean surfaces to receive adhesive for identification materials.

D. Equipment Identification:
   1. Manufacturer's nameplates or trademark shall be permanently affixed to all equipment and materials furnished under this division. Manufacturer's nameplates shall include all pertinent data relative to the piece of equipment including model number, serial number, and operating characteristics as applicable.
   2. Separate Equipment Identification Markers shall identify each item of equipment with a permanently attached marker indicating designation and/or number corresponding to design documents e.g. EF-1, boilers, pumps, etc.
   3. Markers shall be of rigid black bakelite or phenolic construction with white engraved or incised letters.
   4. Lettering on equipment markers shall be of adequate size to be legible from floor levels. In all cases marker lettering shall no be less than 1 inch high.
   5. Mount equipment identification nameplates in a conspicuous place on the equipment.
   6. For equipment mounted above the floor level, mount identification nameplate so that they can be seen from floor level.
   7. Attach nameplates with rivets - sticky back tape type will not be accepted.

E. Piping System Identification:
1. Piping Systems shall be identified as indicated herein or as required by applicable codes and/or officials having jurisdiction.

2. Pipe Markers shall be color coded according to "Table 2: Classification of Materials and Designations to Colors" - ANSI A13.1-1981.

3. Pipe Markers shall indicate direction of flow, system, operating pressure and temperature.

4. Pipe Markers shall be of the pressure sensitive type as manufactured by the Seton Nameplate Corp. (F10-Code)

5. Pipe markers shall be installed at every point of entry and exit through floors, walls, ceilings or other concealment, on each riser, take-off and branch and at each piece of equipment.

6. Install pipe markers at a distance of not less than 25 feet apart in continuous lengths of pipe lines and oriented so that markers are clearly visible. When pipe lines are located above the normal line of vision, the marker shall be placed below the horizontal centerline of the pipe.

F. Valve Identification:

1. Provide laminated plastic nameplates on all valves installed under Division 15, except stop valves in supplies to fixtures. Tags shall be constructed of 0.125 inches thick melamine plastic conforming to Fed. Spec. L-P-387. Surface shall be matte finish. Accurately align lettering and engrave into white core. Nameplates shall be to 2 inches round or hexagonal. Lettering shall be minimum of 0.375 inch high normal block lettering. Key the nameplates to a chart and schedule for each system. Frame one chart and schedule for each system under glass and place where directed in mechanical room. Furnish four copies of each chart and schedule. Each inscription shall identify it's function. Attach nameplates with "S" hooks and chain to each valve. Valve nameplates shall be numbered and "keyed" as follows:

   a. Plumbing nameplates shall be red in color and indicate:

      1) "CW" Cold Water
      2) "HW" Hot Water-indicate design temperature of water
      3) "HWR" Hot Water Return

   b. Fire Protection nameplates shall be blue in color and indicate:

      1) "FP"-indicate zone associated with Fire-Alarm System and indicate riser location.

   c. HVAC nameplates as they apply shall be black in color and indicate:

      1) "HWS" Hot Water Supply (indicate design temperature)
      2) "HWR" Hot Water Return
      3) “S” Steam (indicate design pressure)
      4) “C” Steam Condensate (gravity)
      5) “GAS” Natural/Propane Gas

   d. Chart and schedule shall indicate the following information:

      1) Manufacturer, type, and model number
      2) Capacity or size
System in which it is installed
4) System or equipment which it controls
5) Location keyed into valve number

e. Valve tags and chain shall be securely attached to the valve so that normal operation of the valve or tampering will not allow it to be removed.

G. Ductwork Identification
1. Stencil ductwork with 2 inch high lettering indicating system/service identification and arrows indicating direction of airflow.

2. Color code stenciling for each system; i.e. supply air, return air, exhaust air, etc., to allow for maximum visibility and contrast.

3. Stencil ductwork at each piece of equipment, and at each branch and take-off, but not less than 25 feet apart of any continuous run.

4. Orient ductwork stenciling so that it is clearly visible from floor level.

2.02 SLEEVES, INSERTS AND ESCUTCHEONS

A. Provide sleeves for all work passing through floor, wall, and ceiling construction.

B. Locate and provide sleeves and inserts before the floor, wall or ceiling is constructed. If this Contractor does not comply with the above, he shall bear all costs incurred for cutting and patching required for the installation of sleeves and inserts. Holes required for sleeves in existing walls and floors, or to conform to the above, shall be saw cut or core drilled. This Contractor shall provide all drilling required for the installation of hangers.

C. Pipe sleeves through outside walls and slab-on-grade floor shall be Schedule 80 black steel pipe with 150 lb. black steel slip-on welded flanges welded at the center of the outside. Extend sleeves 1/2 inches beyond each side of the wall. Pack the space between sleeve and pipe with oakum to within 2 inches of each face of the wall. Pack the remaining space and make watertight with an approved waterproof compound. (Inside face of slab-on-grade floor.) For existing wall construction, center flange will not be required.

D. Pipe sleeves through concrete floors or interior masonry walls shall be Schedule 40 black steel pipe, set flush with finished wall or ceiling surfaces, but extending 2 inches above finished floors. Plastic, PVC, or light metal sleeves shall not be installed.

E. Provide individual or strip type inserts pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4 inch diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods to 1/2 inch diameter to be passed through the insert body and shall be similar to Fee and Mason Manufacturing Company Figure 178. Strip inserts shall have attached rods with hooded ends to allow fastening to reinforcing rods shall be similar to Fee and Mason Manufacturing Company, Figure 190.

F. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe and the insulation. Check floor and wall construction finishes to determine proper length of sleeves for various locations.

G. Provide 22 gauge galvanized steel duct sleeves through interior walls, floors and ceilings set flush with finished surfaces.

H. Pack the space between sleeves and structure, and sleeves and pipes or ducts passing through fire rated interior walls, floors, and ceilings with an approved fire and smoke proof packing material.
Fire-stopping material shall maintain its dimensions and integrity while preventing the passage of flame, smoke, and gases under conditions of installation and user when exposed to the ASTM E119 time-temperature curve for a time period equivalent to the rating of the assembly penetrated. Cotton waste shall not ignite when placed in contact with the non-fire side during the test. Fire-stopping material shall be non-combustible as defined by ASTM E136; and in addition, for insulation materials, melt point shall be a minimum of 1700 degrees F. for 1-hour protection and 1850 degrees F. for 2-hour protection.

I. Fasten sleeves securely in floors, walls, etc. so that they will not become displaced when concrete is poured or when construction is built around them. Take precautions to prevent concrete, plaster, or other materials being forced into the space between pipe and sleeve during construction.

J. In all areas where ducts are exposed and pass through floors, the hole shall be surrounded by a 4-inch high by 3-inch wide concrete curb, or otherwise protected as determined by the Engineer.

K. Escutcheon plates shall be provided for all exposed uninsulated pipes passing through walls, floors, and ceilings. Plates shall be nickel plated, of the split ring type, of size to match the pipe. Where plates are provided for pipes passing through sleeves which extend above the floor surface, provide deep recessed plates to conceal pipe sleeves.

2.03 USE OF INSTALLATION

A. The Owners shall have the privilege of using any part of the installation when sufficiently complete, but such use thereof, or partial or final payment shall not be considered as an acceptance of such work in lieu of a written certificate from the Engineer.

PART 3 EXECUTION

3.01 OPERATING INSTRUCTIONS

A. Instruction to the Owner's Personnel - After completion of all work and all tests and at such times as designated by the Engineer, provide the necessary skilled personnel to operate the entire installation for a period of three (3) consecutive days at eight (8) hours each.

B. During the operating period, instruct the Owner's representative in the complete operation, adjustment, and maintenance of the entire installation.

C. Give at least forty-eight (48) hours advance notice to the Owner and Engineer to coordinate scheduling of this instructional period.

D. Furnish to the Engineer five (5) complete bound sets of typewritten or blueprinted instruction manuals for operating and maintaining all systems and equipment included in the contract. All instruction manuals shall be submitted in draft, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.

E. The above mentioned instructions shall include the maintenance schedule for the principal items of equipment furnished under this contract.

F. Manuals shall also contain the following items:

1. Brief description of each system covering its basic operational characteristics.

2. List of all equipment with manufacturer's name and model of each item, corresponding to equipment (letter and/or number) designation on the drawings.

3. Manufacturer's literature describing each item of equipment.

4. Copy of each valve chart.

5. Copy of each automatic control diagram with respective sequence of operation.
6. Parts list of each major item of equipment.
7. Detailed step-by-step instructions for starting summer operation, winter operation, and shutdown of each system.
8. Warranty certificates.
3.02 POSTED OPERATING INSTRUCTIONS:

A. Furnish approved operating instructions for each principal item of equipment for the use of the operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequences for each principal item of equipment. Operating instructions shall be printed or engraved, and shall be framed under glass or in an approved laminated plastic and posted where directed by Engineer. Operating instructions shall be attached to or posted adjacent to each principal item of equipment. Include start up, proper adjustment, operating, lubrication, shut-down, safety precautions, procedure in the event of equipment failure, and other items of equipment. Operating instructions exposed to the weather shall be made weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

3.03 SAFETY REQUIREMENTS:

A. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded. Guards shall consist of heavy angle iron frames, hinged and latched, with heavy galvanized iron wire mesh securely fastened to frames. Provide access to measure speed of driven sheaf without removal. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of a type as specified herein.

3.04 MANUFACTURER'S RECOMMENDATIONS:

A. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

3.05 PROJECT RECORD DOCUMENTS:

A. Each Contractor shall record clearly, neatly, accurately, and promptly as work progresses the following data:

1. Changes made resulting from change orders or instructions issued by the Engineer.
2. Changes in routing made to avoid conflict with other trades or structural conditions.
3. Final location of equipment and panels if different than contract documents.

B. Upon completion of the project submit to the Engineer a set of clean, marked up blue or black line "as built" prints indicating all variations and deviations of his work from contract documents

END OF SECTION
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Equipment bases and supports.
B. Sleeves and seals.
C. Flashing and sealing equipment and flue duct.

1.2 RELATED SECTIONS

A. Section 15010 – Basic Mechanical Requirements.
B. Section 15087A - Vibration Isolation.

1.3 REFERENCES

A. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
B. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
C. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
D. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.4 SUBMITTALS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable mechanical code for support of hydronic piping, equipment, and ductwork.

PART 2 - PRODUCTS

2.1 FLASHING

A. Metal Flashing: 26 gage galvanized steel.
B. Metal Counter flashing: 22 gage galvanized steel.
C. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
D. Caps: Steel, 22 gage (0.8 mm) minimum; 16 gage (1.5 mm) at fire resistant elements.

2.2 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage (1.2 mm thick) galvanized steel.
B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.
C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed, refer to Section 07270.

D. Sleeves for Rectangular Ductwork: Galvanized steel.

E. Fire stopping Insulation: Glass fiber type, non-combustible; refer to Section 07270.

F. Sealant: Acrylic; refer to Section 07901.

2.3 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Provide copper plated hangers and supports for copper piping.

2.4 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in pipe shafts and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.2 INSERTS

A. Provide inserts for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

3.3 EQUIPMENT BASES AND SUPPORTS

A. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

B. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

C. Provide rigid anchors for pipes after vibration isolation components are installed.

3.4 FLASHING

A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
B. Flash vent and soil pipes projecting 3 inches (75 mm) minimum above finished roof surface with lead worked one-inch (25 mm) minimum into hub, 8 inches (200 mm) minimum clear on sides with 24 x 24 inches (600 x 600 mm) sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter flash, and seal.

C. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

3.5 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floors one inch above finished floor level. Chalk sleeves.

D. Where piping penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and chalk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

END OF SECTION
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 work of this section.

B. This section is Division 15 Basic Mechanical Requirements section, and is part of each Division 15 section-making reference to identification devices specified herein.

1.2 SUMMARY

A. This section addresses materials and methods common to more than one Subcontractor. Refer to the drawings to determine the extent of work required of each individual trade.

1.3 DESCRIPTION OF WORK

A. Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division 15 sections.

B. Types of identification devices specified in this section include the following:
   1. Painted Identification Materials
   2. Plastic Equipment Markers

C. Mechanical identification furnished as part of factory-fabricated equipment, is specified as part of equipment assembly in other Division 15 sections.

D. Refer to other Division 15 sections for identification requirements at central-station mechanical control center; not work of this section.

E. Refer to Division 16 sections for identification requirements of electrical work; not work of this section.

1.4 QUALITY ASSURANCE

A. Codes and Standards
   1. ANSI Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.

B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

C. Maintenance Data: Include product data and schedules in maintenance manuals; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide mechanical identification materials of one of the following:
   1. Allen Systems, Inc.
2.2 MECHANICAL IDENTIFICATION MATERIALS

A. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division 15 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

2.3 PAINTED IDENTIFICATION MATERIALS

A. Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 1-1/4" high letters for ductwork and not less than 3/4" high letters for access door signs and similar operational instructions.

B. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.

C. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ANSI A13.1 for colors.

2.4 PLASTIC EQUIPMENT MARKERS

A. General: Provide manufacturer's standard laminated plastic, color-coded equipment markers. Conform to the following color code:
   1. Green: Cooling equipment and components.
   2. Yellow: Heating equipment and components.
   3. Yellow/Green: Combination cooling and heating equipment and components.
   5. Blue: Equipment and components that do not meet any of the above criteria.
   6. For hazardous equipment, use colors and designs recommended by ANSI A13.1.

B. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
   1. Name and plan number.
   2. Equipment service.
   3. Design capacity.
   4. Other design parameters such as pressure drop, entering and leaving conditions, rpm, etc.

C. Size: Provide approximate 2-1/2” x 4” markers for control devices dampers, and valves; and 4-1/2” x 6” for equipment.

2.5 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.

B. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification, which indicates individual system number as well as service (as examples; Boiler No. 3, Air Supply No. 1H, Standpipe F12).
PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Coordination: Where identification is to be applied to surfaces, which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.2 IDENTIFICATION

A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following applicable general categories of equipment and operational devices:
   1. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
   2. Meters, gages, thermometers and similar units.
   3. Fuel-burning units including boilers, furnaces, heaters, stills and absorption units.
   4. Pumps, compressors, chillers, condensers and similar motor-driven units.
   5. Heat exchangers, coils, evaporators, cooling towers, heat recovery units and similar equipment.
   6. Fans, blowers, primary balancing dampers and mixing boxes.
   7. Packaged HVAC central-station or zone-type units.

B. Optional Sign Types: Where lettering larger than 1" height is needed for proper identification, because of distance from normal location of required identification, stenciled signs may be provided in lieu of engraved plastic, at Installer's option.

C. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2'-0", 1/2" high for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 of size of the principal lettering.

D. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

3.3 ADJUSTING AND CLEANING

A. Adjusting: Relocate any mechanical identification device, which has become visually blocked by work of this division or other divisions.

B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

3.4 EXTRA STOCK

A. Furnish minimum of 5% extra stock of each mechanical identification material required, including additional numbered valve tags (not less than 3) for each piping system, additional piping system identification markers, and additional plastic laminate engraving blanks of assorted sizes.

B. Where stenciled markers are provided, clean and retain stencils after completion of paints and applicators.

END OF SECTION
PART 1 GENERAL

1.1 RELATED DOCUMENTS
   A. Inertia bases
   B. Vibration isolation

1.2 REFERENCES
   A. ASHRAE - Guide to Average Noise Criteria Curves.

1.3 QUALITY ASSURANCE
   A. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition.

1.4 CERTIFICATES
   A. Submit manufacturer's certificate that isolators are properly installed and properly adjusted to meet or exceed specified requirements

PART 2 - PRODUCTS

2.1 ISOLATION PRODUCTS
   A. TYPE A - ACCOUSTICAL FLOOR, CEILING AND WALL SEAL

       Where piping passes through equipment walls, floors or ceilings, the vibration isolator manufacturer shall provide a split seal consisting of two bolted pipe halves with 3/4" or thicker neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of 1" past either face of the wall. Where temperatures exceed 240 F, 10# density fiberglass may be type SWS as manufactured by Mason Industries, Inc., or equal.

2.2 FABRICATION
   A. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.
   B. Color code spring mounts.
   C. Select springs to operate at 2/3 maximum compression strain, with 1/4 inch ribbed neoprene pads.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS
   A. Install vibration isolators for motor driven equipment.

       See drawings for type to be used for each piece of equipment.

END OF SECTION
Town of Sprague
Public Works Equipment Storage Building
Baltic Reservoir Access Road
Sprague, Ct.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Propeller fans
B. Motors and drives
C. Belt guards
D. Inlet/outlet screens
E. Access doors

1.2 RELATED WORK

A. Section 15242 – Vibration Isolation.

1.3 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
B. Sound Ratings: AMCA 301, tested to AMCA 300
C. Fabrication: Conform to AMCA 99

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data
B. Include instructions for lubrication, motor and drive replacement, spare parts list and wiring diagrams.

PART 2 - PRODUCTS

2.1 GENERAL

A. Fans used shall not decrease motor size, increase noise level, or increase tip speed by more than 10 percent, or increase inlet air velocity by more than 20 percent, from specified criteria. Fans shall be capable of accommodating static pressure variations of plus or minus 10 percent.
B. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas.

2.2 WALL EXHAUST FANS

A. Airfoil Impeller Blades: Adjustable die cast aluminum alloy or glass reinforced polyester resin or welded steel die formed blades with belt drive.
B. Hub: Die cast aluminum alloy or cast iron hub or with belt drive of spun, welded steel, bored and keyed to shaft; to facilitate indexing of blade angle with [manual] [automatic] adjustment stops.
C. Controllable Pitch Assemblies: Incorporate ball bearing counterbalanced blade and variable pitch assembly into hub with mechanical link to casing exterior mounted actuator, or pneumatic or electric actuator incorporated within hub.
D. Cast Components: X-ray components after fabrication and statically and dynamically balance assembly before attachment to motor or shaft.
2.3 CASING

A. Fabricate casing of 1/4 inch steel for fans 40 inch in diameter and smaller and 3/8 inch steel for larger fans.

B. Weld, with inlet and outlet flange connections, and motor or shaft supports. Incorporate flow straightening guide vanes for fans specified for static pressures greater than one inch wg.

C. Finish with one coat enamel applied to interior and exterior.

2.4 MOTORS AND DRIVES

A. Motors: As indicated.

B. Bearings: ANSI/AFBMA 9, L-10 life at 50,000 hours, heavy duty pillow block type, self-aligning, grease-lubricated ball bearings, or ANSI/AFBMA 11 L-10 life at 50,000 hours, pillow block type, self-aligning, grease-lubricated roller bearings.

C. Shafts: Hot rolled steel, ground and polished, with key-way; protectively coated with lubricating oil.

D. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors 15 hp and under selected so required rpm is obtained with sheaves set at mid-position; fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

E. Belt Guard: Fabricate to SMACNA Low Pressure Duct Construction Standards; of 12 gage, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

F. Lubrication: Extend lubrication fittings to outside of casing.

2.5 ACCESSORIES

A. Inlet Screens: Galvanized steel welded grid to fit inlet bell.

B. Dampers: Welded steel construction, consisting of two semi-circular vanes pivoted on oil-retaining bearings in short casing section, finished with one coat enamel. Provide [airstream operation closing blades by reverse air flow and gravity.] [hand operation with handwheel control of screw and link mechanism.] [motor actuation].

C. Access Doors: Shaped to conform to casing with quick opening latches and gaskets.

D. Blade Pitch Actuator: Factory mounted and calibrated, [electric actuator requiring single phase power and accepting electric input.] [electric actuator requiring single phase power and accepting pneumatic control input signal.] [pneumatic actuator requiring 25 psi main supply pressure and accepting pneumatic control input signal]

2.6 PROPELLER FAN

A. Impeller: Shaped steel or steel reinforced aluminum blade with heavy hubs, statically and dynamically balanced, keyed and locked to shaft, directly connected to motor or provided with V-belt.

B. Motor: Self-aligning pre-lubricated ball or sleeve bearings affixed to mounting plate permitting belt tensioning, neoprene vibration isolation between fan assembly and mounting plate.

C. Frame: One piece, square steel with die formed venturi orifice, mounting flanges and supports, with baked enamel finish.

D. Safety Screens: One inch galvanized wire over inlet, motor, and drive and backdraft damper for
PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wall exhaust fans as indicated or specified. Install with resilient mountings and with flexible electrical leads.
B. Provide sheaves required for final air balance.
C. Provide sheaves required for final air balance.
D. Provide safety screen where inlet or outlet is exposed.
E. Provide backdraft dampers on discharge of exhaust axial fans and as indicated
PART 1  GENERAL

1.01 WORK INCLUDED

A. Wall exhausters

1.01 RELATED WORK

A. Section 15860 – Centrifugal Fans

1.03 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.

D. Fans for use with grease extraction devices must be UL listed for Restaurant Exhaust Appliances and be approved to operate continuously while exhausting 300 degrees F.

PART 2  PRODUCTS

2.01 WALL EXHAUSTERS

A. Centrifugal or Axial Fan Unit: V-belt or direct driven, with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 16 gage aluminum bird screen; secured with cadmium plated bolts and screws.

B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and wall mounted solid state speed controller for all direct drive units.

C. Backdraft Damper: Gravity activated, aluminum multiple blade construction, felt edged with nylon bearings.

D. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball
PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure wall exhausters with lag screws to siding structural steel.

END OF SECTION
PART 1 GENERAL

1.01 WORK INCLUDED
   A. Louvers

1.02 QUALITY ASSURANCE
   A. Test and rate performance of louvers in accordance with AMCA 500.

1.03 REGULATORY REQUIREMENTS
   A. Conform to ANSI/NFPA 90A

PART 2 PRODUCTS

2.01 LOUVERS
   A. Provide 4 inch deep louvers with blades on 45 degree slope with center baffle and return bend, heavy channel frame, birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake.
   B. Fabricate of 16 gage galvanized steel or 12 gage extruded aluminum, welded assembly, with factory baked enamel or color anodized finish.
   C. Furnish with exterior flat flange or angle flange for installation.
   D. Furnish automatic damper at each louver with motor and drive linkage to open when wall fans start

PART 3 EXECUTION

3.01 INSTALLATION
   A. Install items in accordance with manufacturers’ instructions
   B. See schedule on drawings for all sizes and types of air louvers

END OF SECTION
PART 1  GENERAL

1.01  SECTION INCLUDES

A. Monoxide Detection System

B. Central fan system

1.02  RELATED SECTIONS

A. Section 15973 - Pneumatic Control Systems.

B. Section 15975 - Direct Digital Control Systems

1.03  SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are also specified.

1.04  SUBMITTALS

A. Submit under provisions of Division 1 Specifications.

B. Submit diagrams indicating mechanical system controlled and control system components. Label with settings, adjustable range of control and limits. Include written description of control sequence.

C. Include flow diagrams for each control system, graphically depicting control logic.

D. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

1.05  PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 1 Specifications.

B. Accurately record actual setpoints and settings of controls, including changes to sequences made after submission of shop drawings.
PART 2 PRODUCTS

2.02 AUTOMATIC CONTROL DAMPERS

A. Provide all new control dampers required, including fresh air dampers, dampers of size and capacity specified. Pressure drop shall suit the application as specified. All dampers shall be low leakage type.

B. Coordinate size, type and location of dampers with relevant trade.

C. Two-position dampers shall be sized for minimum pressure drop, at the specified duct size.

D. Damper frames shall be of not less than 13 gauge galvanized steel, formed for extra strength, with mounting holes for enclosed duct mounting.

E. Damper blades shall be of not less than 16 gauge galvanized steel, formed for strength and high velocity performance. Blades on all multi-blade dampers shall not be over 8" in width. Damper blades shall have neoprene edging.

F. Secure blades to 1/2" diameter zinc plated axles with zinc plated bolts and nuts. Blade side edges shall seal off against spring stainless steel seals.

G. Provide teflon coated thrust bearings at each end of every blade to minimize torque requirements and ensure smooth operation. For smoke and low leakage dampers, use high temperature oilite thrust bearings.

H. All blade linkage hardware shall be constructed of corrosion resistant zinc plated steel and brass. Weldments shall be protected by zinc rich (ZRC) paint touchup.

I. Dampers shall be supplied in standard sizes, in 2" even increments both for width and length. If the required size falls between the 2" increments, the damper shall be fitted with galvanized adjustable baffles.

J. Provide dampers other than smoke dampers suitable for operation within the temperature limit - 40 to 200 degrees F.
K. Low leakage dampers shall be similar to automatic control dampers, but with special inflatable seal edging applied to blades suitable for temperatures up to 400 degrees F. Seal and damper construction shall be such that the leakage in the fully closed position will not exceed 4 cfm per square foot of damper area at 6" W.C. of differential across the damper.

L. Use low leakage dampers for the following applications:

1. Outdoor air intake dampers

2. Exhaust and relief air dampers

3. Smoke control dampers, including air dampers which prevent smoke exhaust air from leaking into air supply systems

M. Provide one (1) electric damper actuator for every 16 square feet of damper face

N. The damper actuator shall include the necessary hardware and brackets to allow proper mounting and connection to a standard 1/2" diameter damper shaft. The actuator shall be rigidly mounted.

2.03 POSITIVE POSITIONING RELAYS

A. All positive positioning relays provided shall have positive mechanical feedback of the controlled device.

2.04 SMOKE SENSORS

A. Smoke sensors will be provided under Division 16 and installed by mechanical contractor.

B. Smoke sensors shall be arranged to give uniform and complete coverage.

C. Smoke protection devices shall be wired to fan to start wall fans and open wall louver dampers.
Town of Sprague  
Public Works Equipment Storage Building  
Baltic Reservoir Access Road  
Sprague, Ct.

2.05 SENSORS – GENERAL

A. All sensors and controllers shall be of commercial grade quality and shall be installed to the manufacturer's recommendations. Provide full details of all sensors and controllers in shop drawings, including their range and accuracy.

2.06 ELECTRIC SENSORS

A. Sensors shall have ranges to suit the requirements, be factory calibrated, tamper proof construction and of corrosion resistant construction.

2.07 GENERAL

A. All motors which are automatically controlled shall have HOA switches. In the auto position, motors shall function as described in their respective operating sequence. In the hand position, motors shall operate independent of their respective operating sequences, unless motor-operated dampers would starve the fan of air flow. These dampers shall also operate when the switch is placed in the hand position.

B. All control wiring, regardless of voltage, shall be the responsibility of the controls contractor. All electrical wiring shall conform to local and state codes. All control wiring shall be run within rigid steel conduit with threaded fittings, or electrical metallic (steel) tubing with gland and ring or steel set screw type waterproof fittings.

PART 3 EXECUTION

END OF SECTION
SECTION 16010 – ELECTRICAL GENERAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Work that applies to all sections of DIVISION 16
2. Temporary electrical wiring
3. Removals (demolition) and relocations

1.3 RELATED DOCUMENTS

A. The General Conditions, Supplementary Conditions, and applicable portions of Division 1 of the specification are part of Division 16 which shall consist of all labor, equipment, materials and other costs necessary to complete all ELECTRICAL MATERIALS AND METHODS work indicated on the drawings, herein specified or both.

1.4 RELATED WORK SPECIFIED UNDER OTHER SECTIONS: Read these DIVISIONS carefully. For purposes of bidding, assume that all work of the DIVISION referenced is to be performed under that DIVISION unless specifically indicated therein to be performed under the ELECTRICAL DIVISION. Refer to the Architects Specification on drawings for division specification sections not included in this specification.

A. Allowances – see DIVISION 1.
B. Alternatives - see DIVISION 1.
C. Excavation and Backfilling – see DIVISION 2.
D. Concrete - see DIVISION 3.
E. Handholes – see DIVISION 3.
F. Painting of all backboards (on all sides and edges before mounting); painting of panels (trims and doors - 2 coats before mounting); painting of exposed electrical raceways, boxes and fittings - see DIVISION 9.
1.6 DEFINITIONS

A. Provide: Furnish and install.

B. Wiring: Wire, raceways, boxes and fittings.

1.7 PERMITS AND FEES

A. Obtain all permits for the work of this section

B. Pay all fees, including a FINAL INSPECTION FEES.

1.8 SUBMITTALS

A. Product Data: For each product indicated

B. Shop Drawings: Wiring and connection diagrams

C. Manufacturers: Where the drawings or specifications list specific brands or catalog numbers, only these products may be used unless the words: “or approved equal” or “but are not limited to” are included.

D. Limitations of approval: The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Engineer's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Engineer in writing of such deviation, in a separate cover letter on Contractor's letterhead, at the time of submittal and the Engineer has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Engineer's approval thereof.

E. Contractor’s responsibility: It is the responsibility of the Contractor to check all dimensions and details on shop drawings, before submission to the Engineer, reject same if necessary and only forward to the Engineer shop drawings which he is reasonably certain fulfill the requirements of the contract documents and the work. The approval of shop drawings by the Engineer shall be general only in character and not mean dimensions on drawings have been checked, and will in no way relieve the Contractor of the responsibility for proper fitting and construction of the work, nor from the necessity of furnishing materials or doing the work required by the drawings and/or specifications, which may not be indicated on the shop drawings when approved. All shop drawings shall be checked by the Contractor, and must bear the Contractor’s stamp of approval; drawings submitted without this stamp of approval will not be considered.

F. Samples: Provide all samples requested by the Engineer.
B. Test: Test the complete installation to prove it free from shorts, grounds, opens and faulty connections. Make any corrections necessary before acceptance.

1. Test each function of each system including each device.

C. Certification: Upon request, provide "Certification" (by a recognized testing agency or a Professional Engineer registered in the state where the project is located) that submitted items of equipment are suitable for their intended use.

D. Record of Addenda and Change Orders: To avoid overlooking addenda and change order modifications, mark all changes on all copies of drawings and specifications, in a manner acceptable to the Engineer. One method of accomplishing this is to make copies and tape them on the back of the preceding page (tape all edges). Also, circle the changed area and note: see addenda #1, etc. If whole pages or sheets change, either remove the superseded document or put a bold "X" through it.

E. Record Drawings: Owner's record drawings shall be updated as the project progresses. Maintain documents in a safe, dry location. Indicate clearly and accurately any changes necessitated by field conditions and dimension all raceways built into or under concrete slabs or buried under ground.

F. Operating Instructions and Manuals: Provide the Owner or his representative with complete operating instructions by qualified personnel of all electrical systems. Provide three (3) bound sets (indexed and bound in three sturdy three-ring binders) of operating and maintenance instructions of all electrical systems employed and all shop drawings.

G. Manuals: Provide one (1) extra bound set of all shop drawings. Bind in a sturdy 3-ring binder.

H. Letter of Confirmation: Include in the above manuals a letter confirming that the following items have been completed. Provide written receipt signed by the Owner or his representative indicating that the first 4 items listed below have been received.

1. The number of circuit breaker locks called for have been provided.
2. Keys have been provided for all locked electrical equipment.
3. The provisions of the "Operating Instructions and Manuals" paragraph of these specifications have been met.
4. Spare fuses have been provided.
5. Identification is complete and in accordance with these specifications.
6. As-built electrical drawings have been completed and submitted.
7. All tests are complete and in accordance with these specifications.
8. All required shop drawings have been submitted and approved.
9. The entire installation has been accepted by all authorities.

1.9 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Do all wiring and provide all equipment in accordance with the prevailing issue of the National Electrical Code, State Building Code, State Fire Code, OSHA and any additional local rules or requirements.

C. Obtain and pay for all necessary permits, certificates, reviews, etc. Present satisfactory proof of final inspection and approval by all inspection authorities.

D. Consider the most current edition (as of the date of this specification) of the following Industry Standards as minimum requirements for all materials, equipment and systems where such standards are established for materials in question:

1. National Board of Fire Underwriters
2. National Electrical Manufacturers Association
3. National Fire Protection Association
4. Institute of Electrical and Electronic Engineers
5. A nationally recognized testing laboratory (UL, ETL, etc.)
6. Factory Mutual
7. Americans with Disabilities Act
8. American National Standards Institute
9. TIA/EIA
10. BICSI TDDM

E. Where applicable, this installation shall comply with the most recent edition of the following NECA (National Electrical Contractors Association) “National Electrical Installation Standards.” Except, if there is a conflict between this specification and these standards, the requirements of this specification shall prevail.

1. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting
2. NECA 101 Standard for Installing Steel Conduit (Rigid, EMT)
3. NECA/IESNA 500 Recommended Practice for Installing Indoor Commercial Lighting Systems
4. NECA/BICSI 568(B) Telecommunications
1.10 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

D. Electrical Contractor shall review that portion of submittals from other divisions which effects the electrical equipment and adjust the sizing of conductors, conduits and over current protection devices according to substitutions made. Monetary settlement for such substitutions shall be between Electrical Contractor and the party making the substitution.

1.11 TEMPORARY ELECTRICAL WIRING:

A. The owner shall be responsible for all costs associated with energy usage during the renovation.

B. Provide all required connections, branch circuit wiring, lighting fixtures, lamps, receptacles, switches, etc. for a complete and operating temporary electrical system. Electrical Contractor may extend temporary power from the existing electrical facilities.

C. Provide a minimum of 10 footcandles of temporary general illumination throughout the floor area of the building.

D. Existing lighting may be used where it is sufficient and remains energized.

E. All receptacles must be GFCI protected and the entire installation must comply with all applicable OSHA requirements.

F. At the end of the day's work, disconnect all lights and power, other than the minimum required security illumination.

G. Provide replacement light bulbs and maintenance of the temporary wiring system, as required, throughout the period of construction.

H. Conform to all codes and regulations.
1.12 CHANGE ORDERS/PROPOSAL REQUESTS:

A. Refer to DIVISION 1 of these specifications and add the following:

B. During the course of construction, changes in the work may occur. When a significant change is to be made, a Proposal Request will be issued.

C. Provide a complete cost breakdown when responding to each Proposal Request.

D. Each item of work to be priced separately.

E. Each line item to be broken down including quantities and listing separately labor and material.

F. Both credits and extras shall be separately and clearly quantified.

G. Allowances for overhead and profit shall be as listed in the supplementary conditions.

H. If you become aware of a field condition, code requirement, error, or omission that you feel should result in a change to the work, please contact the Engineer for discussion. The Engineer may be able to clarify the situation and avoid unnecessary paperwork.

1.13 INSPECTIONS/SITE OBSERVATIONS

A. The authority having jurisdiction (usually the Municipal Electrical Inspector) shall be notified at periodic intervals that an inspection is requested. Inspections shall be requested at points of progress, meeting the approval of the inspector.

1.14 GUARANTEES/WARRANTIES:

A. Refer to Division 1 of these specifications and add the following:

B. A minimum warrantee time of one year from date of acceptance by the Engineer.

C. The Owner reserves the right to make appropriate modifications or extensions of systems and equipment furnished under this contract during the guarantee/warranty period without "voiding" or modifying the guarantee/warranty of equipment and wiring installed under this contract. If manufacturer voids guarantee, it shall not relieve this contractor of his responsibilities for guarantee/warranty period.
1.15 MISCELLANEOUS

A. Provide all systems complete. Drawings and Specifications form complementary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both.

B. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.

C. All wiring and connections to be done with associated circuit de-energized.

PART 2 - PRODUCTS

2.1 MATERIALS - General:

A. All materials and equipment to be new unless specifically stated otherwise.

B. Materials and equipment shall be suitable for their intended use and for the environment in which they are installed. For example, equipment located outside shall be weatherproof and constructed of materials that will not rust. This includes brackets, screws, etc.

C. Coordinate all dimensions to make sure that boxes, raceways, equipment, fixtures, etc., fit properly in the finished construction. If special provisions, such as shallow boxes, are required, they shall be provided at no increase in contract price, regardless of catalog numbers listed in contract documents or on shop drawings.

D. As it is not practical to enumerate in these specifications (or show on the drawings) all details of fittings and accessory equipment required for proper operation of the various electrical systems herein described, it is understood that they will be supplied without extra compensation. Provide all fittings, terminations, relays, components of panels and equipment, etc., needed for the best performance possible at the present state-of-the-art.

2.2 EQUIPMENT BACKBOARDS

A. Where not otherwise specified, equipment backboards shall be fire rated, exterior grade, AC grade, installed with ‘A’ side exposed.
PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components so as to allow for safe personnel movement and maintenance access.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 LAYOUTS

A. The electrical system layouts indicated are generally diagrammatic and locations of outlets and equipment are approximate only. Exact routing of wiring and locations of outlets and equipment shall be governed by structural conditions and obstructions. This is not to be construed to permit redesigning systems. Interconnect as shown.

B. Locate all equipment requiring maintenance and operation so that it will be readily accessible. The right is reserved to make any reasonable change in location of outlets and equipment prior to roughing-in without involving additional expense. This may involve slightly longer wiring runs, longer stems, additional mounting provisions, etc. Allow for this in your bid because additional compensation will not be provided. Items not specifically located on the plans shall (for the purposes of bidding) be assumed to be in the farthest, most difficult location. Exact location to be as directed in the field.

3.3 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials, slotted channel system components.

B. Dry Locations: Steel materials.

C. Strength of Supports: Adequate to carry present and future loads, times a safety
factor of at least four with, 200-lb (90-kg) minimum design load for each support element.

3.4 SEQUENCE AND BALANCE:

A. Maintain correct phase sequence of all feeders and circuits by establishing phase identification and maintaining correct relationship throughout the system. Provide line balance within 10% of normal loads.

3.5 WORK INTERFERING WITH EXISTING WIRING:

B. Make any necessary re-circuiting, extensions of existing circuits and relocations required to properly re-energize remaining existing devices or equipment that may be interfered with by new construction or removals.

3.6 CUTTING AND PATCHING

A. Refer to Division 1 of these specifications and add the following:

B. All holes will be cut by the electrical contractor up to and including 5” diameter. Holes larger than that size will be cut by the GC.

C. GC will also be responsible for patching all existing open holes and holes where utility lines were removed leaving an open hole. All trenching and infill in concrete floors will be by the GC. See Architectural and Structural construction documents for trenching and backfill where required.

D. This trade Electrical Contractor is responsible for its respective cutting and patching.

E. Do not endanger any work by cutting or altering work or any part of it.

F. Do not cut or alter work of another Contractor without written consent of the Engineer.

G. Prior to cutting which affects structural safety of project, or work of another Contractor, submit written notice to the Engineer, requesting consent to proceed with cutting.

H. Perform all work of fitting, adjustment, cutting, patching, finishing and restoration to perfectly match the quality as specified throughout these specifications. Painting, under DIVISION 9, shall match and be feathered into adjacent surfaces.
3.7 CLEANING, PAINTING AND REFINISHING:

A. Refer to Division 1 of these specifications and add the following:

B. Paint all new plywood backboards on all sides and edges before mounting, under DIVISION 9.

C. Thoroughly clean all new electrical equipment, devices and enclosures upon completion of all work.

D. Refinish any new electrical equipment whose finish is damaged or rusted, as determined by the Engineer.

3.8 Lifts and Scaffolding:

A. All necessary lifts, cranes, scaffolding shall be by the Electrical Contractor.

END OF SECTION
SECTION 16060 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors shall conform to ASTM B3 and B8 as applicable.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, listed for use.

1. Pipe Connectors: Clamp type, sized for pipe.
PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger, unless otherwise indicated.

B. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors in all circuits.

B. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service or at isolated ground bar in panelboard.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
SECTION 16073 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Hangers and supports for electrical equipment and systems.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 SUBMITTALS

A. Product Data: For steel slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
   1. Trapeze hangers. Include Product Data for components.
   2. Steel slotted channel systems. Include Product Data for components.
   3. Equipment supports.

C. Welding certificates

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.
PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

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

1. Allied Tube & Conduit.
2. Cooper B-Line, Inc.; a division of Cooper Industries.
3. ERICO International Corporation.
4. Thomas & Betts Corporation.
5. Unistrut; Tyco International, Ltd.
6. Power Strut

C. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

D. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

E. Channel Dimensions: Selected for applicable load criteria.

F. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

G. Conduit and Cable Support Devices: Steel and malleable iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

H. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

I. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

J. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout
capacities appropriate for supported loads and building materials where used.

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

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) Simpson Strong-Tie Co., Inc.; MasterSet Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

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

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Hilti Inc.
3) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.


2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 5 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity (weight bearing and raceway/cable accommodation) exceeds the current need by 25%.

1. Secure raceways and cables to these supports with conduit clamps listed for the use.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

E. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

F. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

G. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

H. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69, or Spring-tension clamps.

7. To Light Steel: Sheet metal screws.

8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

I. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Identification for conductors.
   2. Equipment identification labels.

1.2 SUBMITTALS

B. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.


D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.2 WARNING LABELS AND SIGNS


B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:
   1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

2.3 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a black background. Minimum letter height shall be 3/8 inch.

2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 9 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after completing finish work.

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

3.2 IDENTIFICATION SCHEDULE

E. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
1. Power.

F. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for all conductors.

   a. Color shall be factory applied or field applied for sizes larger than No. 10 AWG.
   b. Colors for 240/120-V Circuits:

      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
      4) Neutral: White
      5) Ground: Green
      6) Isolated Ground: Green with trace ID

   c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power:

2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

   a. Power transfer switches/devices.
   b. Controls with external control power connections.

H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
   
a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.

END OF SECTION
SECTION 16120 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS

PART 1 -

PART 2 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Specification Section 16050 Common Work Results For Electrical.

1.2 SUMMARY

A. This Section includes the following:
   1. Building wires rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.
   3. Sleeves and sleeve seals.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field quality-control test reports.
1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 3 - PRODUCTS

2.1 CONDUCTORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. American Insulated Wire Corp.
   2. Southwire Company.
   3. Equal approved by Engineer.

B. All conductors and insulation shall comply with NEMA WC 70.

C. Conductor Material: Copper complying with NEMA WC 5 solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

D. Conductor Insulation Types: Type THHN-THWN or XHHW complying with NEMA WC 5.

2.2 CONNECTORS AND SPLICES

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
   1. AFC Cable Systems, Inc.
   3. O-Z/Gedney; EGS Electrical Group LLC.
   4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.
6. Equal approved by Engineer.

F. Description: Spring-type factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

G. Do not use push-in type wire connectors, use spring type instead.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: All conductors shall be copper unless noted otherwise on the drawings.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND WIRING METHODS

A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

B. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

C. Exposed Branch Circuits: Type THHN-THWN, single conductors in raceway.

D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Class 1 Control Circuits: Type THHN-THWN, in raceway.

F. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS

G. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Confirm conduit ID and that conduit will be at or below 40% filled. Confirm jam ratios and take precautions when pulling.

H. Use pulling means, including fish tape, rope, and basket-weave wire grips, that will not damage raceway.
I. Identify and color-code conductors according to Section 16075 "Identification for Electrical Systems."

J. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

K. Where the number of current-carrying conductors in a raceway exceeds three, the allowable ampacity shall be reduced per NEC table based on no diversity. Consider neutrals to be current carrying conductors.

3.4 CONNECTIONS

A. Make all final connections required for a complete and fully operational facility.

B. Wiring connections to equipment shall include connections to all accessories. For example, if a fan has an associated damper, the wiring must be extended from the fan to the damper at no additional charge. Another example is interconnection of equipment. Some items of equipment consist of several pieces, which must be interconnected before connecting to the circuit. No additional compensation will be paid for interconnections.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

D. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

   1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

E. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

F. Locations of junction boxes, stub-ups and disconnects are diagrammatic. At the time of design, the exact brand of equipment is usually not known. Therefore, the exact locations of connections are not known. For the purposes of bidding assume the worst, farthest locations. During construction, coordinate connections with final approved shop drawings and coordinate with other trades. Conform to manufactures written installation instructions. Provide working space in compliance with code.
3.5 FIELD QUALITY CONTROL

A. All raceway installed under this contract are to be protected from damage prior to installation, during installation, and after installation. Store raceway in a dry area protected from physical damage. Before installing raceway shall be clear, dry and free from burs or sharp edges. When raceway pass through metal partitions, provide permanently installed insulating bushings; this applies to all raceway installed under this contract (systems, communications, etc.). Insulated bushings are to be installed prior to pulling in of raceway. Raceway shall be installed back from edge of studs as required by Code.

B. Perform tests and inspections and prepare test reports per NETA testing standards.

C. Tests and Inspections:
   1. After installing conductors and before electrical circuitry has been energized, test service entrance conductors, all feeder conductors, and conductors #8AWG and larger for compliance with requirements.

D. Test Reports: Prepare and provide to Owner and Engineer a written report to record the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION
SECTION 16130 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.3 QUALITY ASSURANCE

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. IMC: ANSI C80.6.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.


2. Fittings for EMT: Steel, set-screw type or compressed type.
2.2 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

C. Description: For indoor applications sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated. For outdoor applications, stainless steel, sheet metal sized and shaped as indicated, NEMA 250, Type 3R, with stainless steel hardware, unless otherwise noted.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

E. Wireway Covers: Screw-cover type

F. Finish: Manufacturer's standard enamel finish.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

F. Cabinets:
1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

   1. Exposed Conduit: Rigid steel conduit, EMT, RNC, Type EPC-80-PVC.
   2. Concealed Conduit, Aboveground: Rigid steel conduit, EMT
   3. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   3. Damp or Wet Locations: Rigid steel conduit or Schedule 80.
   4. Raceways for Communications Cable: EMT.
   5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

   1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Complete raceway installation before starting conductor installation.
C. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

D. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.

E. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

F. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

G. Raceways for Communications Cable: Install as follows:

1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

H. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.
Town of Sprague
Public Works Equipment Storage Building
Baltic Reservoir Access Road
Sprague, Ct.

I. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

J. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

K. Set metal floor boxes level and flush with finished floor surface.

END OF SECTION
SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Receptacles, receptacles with integral GFCI, and associated device plates.
   2. Wall-box motion sensors.
   3. Snap switches and wall-box dimmers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

   1. Cooper Wiring Devices; a division of Cooper Industries, Inc.
   3. Pass & Seymour/Legrand; Wiring Devices & Accessories

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

   1. Cooper Wiring Devices; a division of Cooper Industries, Inc.
   3. Pass & Seymour/Legrand; Wiring Devices & Accessories
2.2 STRAIGHT BLADE RECEPTACLES


2.3 GFCI RECEPTACLES

A. General Description: Straight blade type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, 125 V, 20 A and include indicator light that is lighted when device is tripped. Heavy Duty Commercial Specification grade.

2.4 SNAP SWITCHES

A. Heavy Duty Commercial Specification grade.

B. Comply with NEMA WD 1 and UL 20.

C. Switches, 120/277 V, 20 A:

2.5 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover. Must be in use weatherproof rated.

2.7 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices finished to be as selected by Architect, unless otherwise indicated.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:
   1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:
   1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. Device must be securely fastened against box / wall. Cover plate to tightly mate with wall without gap.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left. Match existing orientations.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Electrical Identification."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
2. Using the test plug, verify that the device and its outlet box are securely mounted.
3. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

4. Report any testing deficiencies to engineer.

END OF SECTION
SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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:
   1. Fusible switches.
   2. Nonfusible switches.
   3. Molded-case circuit breakers (MCCBs).
   5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to Section 260548.

   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
7. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
8. Wiring Diagrams: For power, signal, and control wiring.

B. Qualification Data: For qualified testing agency.

C. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

E. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
   2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended application.

E. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).

1.8 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

1. General Electric Company

B. Type GD, General Duty: not allowed.

C. Type HD, Heavy Duty, Single Throw, 600-V AC, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and
aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

E. All fusible switches: shall be rated for the application voltage specified and have a UL listed short circuit rating to match the fuse installed.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

1. General Electric Company

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

D. Type HD, Heavy-Duty, Single-Throw Fusible Switch: 600-V ac, at indicated amperage; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate indicated fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

E. Type HD, Heavy-Duty, Single-Throw Nonfusible Switch: 600-V ac, at indicated amperage; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, available manufactur-
ers offering products that may be incorporated into the Work include the following:

1. General Electric Company

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.


E. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

F. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

G. Switching Duty: All single pole circuit breakers shall be rated SWD.

H. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
6. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
7. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Anchor floor-mounting switches to concrete base.

C. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in fusible devices.

F. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

G. Do not mount switches or circuit breakers upside down or side ways.

3.3 IDENTIFICATION

A. Comply with requirements in Division 16 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in
Town of Sprague  
Public Works Equipment Storage Building  
Baltic Reservoir Access Road  
Sprague, Ct.


2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

B. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Thermal-magnetic circuit breakers:

1. Test circuit and correct deficiencies
2. Set magnetic trip at minimum.
3. Turn associated loads “on”.
4. Turn breaker on/off a minimum of six (6) times.
5. If nuisance tripping occurs, set “up” one notch and repeat test.
6. Repeat steps 4 and 5 until nuisance tripping no longer occurs.

END OF SECTION
SECTION 16420 - HVAC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:

1. Electrical work relating to the work of Division 15 “MECHANICAL”.

1.2 RELATED DOCUMENTS:

A. The General Conditions, Supplementary Conditions, and applicable portions of Division 1 of the specification are part of this section which shall consist of all labor, equipment, materials and other costs necessary to complete all HVAC ELECTRICAL REQUIREMENTS work indicated on the drawings, herein specified or both.

B. The applicable portions of section 16050 COMMON WORK RESULTS OF ELECTRICAL are hereby make a part of this section. It is important that you read that section carefully because it expands upon the requirements herein.

1.3 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Wiring and connection diagrams.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufactures listed.
2.2 HVAC

A. Provide all wire, conduit, boxes and fittings for all HVAC and plumbing equipment and final connections. Conform to Division 16, Section “Conductors and Cables”.

B. Examine DIVISION 16 carefully for any work specified as performed under this Section and coordinate.

C. Provide all disconnects according to Division 16, Section “Enclosed Switches and Circuit Breakers”.

D. Provide nameplates on all disconnects according to Division 16, Section “Basic Materials and Methods”.

E. Provide a manual starter (thermal toggle switch) at each motor not furnished with an automatic starter. Manual starters to consist of a manual operated toggle switch equipped with a melting alloy type thermal overload relay. Starters must be inoperative if thermal unit is removed. Mount at motor location.

F. Do not use electrical drawings for location of feeds to mechanical equipment. In general, use mechanical drawings for bidding purposes and final approved mechanical shop drawings for actual installation. However, report any discrepancies to mechanical and electrical engineer for final determination, prior to installation.

2.3 MAGNETIC STARTERS

A. General Requirements: Provide across-the-line magnetic type starters rated in accordance with NEMA standards, sizes, and horsepower ratings, where indicated on the drawings. Provide enclosures NEMA and UL rated for the environment. Unless otherwise indicated, as a minimum provide NEMA 1 (general purpose) indoors and NEMA 4 (watertight) in damp locations and outdoors.

B. Manufacturers: Provide starters as manufactured by General Electric to match the building standard.

C. Contacts: Provide double break silver alloy contacts. Construct such that contacts are replaceable without removing power wiring or removing starters from the panel. Provide straight-through wiring.

D. Overload Relays and Thermal Units: Provide melting alloy type overload relays with a replaceable control circuit. Construct thermal units of one-piece design and make interchangeable. Make starter inoperative if the thermal unit is removed.
E. Coils: Provide coils of molded construction. Construct such that coils are replaceable from the front without removing the starter from the panel.

F. Auxiliary Contacts: Make starters suitable for the addition of up to three external auxiliary contacts of any arrangement (normally open or normally closed). Provide auxiliary contacts necessary to perform all intended functions.

G. Special Features: Provide the following special features as indicated on the electrical or mechanical drawings or specifications:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAND-OFF-AUTO</td>
<td>Provide three-position H-O-A switch in cover.</td>
</tr>
<tr>
<td>START-STOP</td>
<td>Provide start-stop momentary push buttons in cover.</td>
</tr>
<tr>
<td>PILOT LIGHT</td>
<td>Provide pilot light in cover of enclosure.</td>
</tr>
</tbody>
</table>

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install according to NEMA standards.

B. Mount plumb and rigid without distortion of box.

C. Provide supports and nameplates, according to Division 16 section “Basic Electrical Materials and Methods”.

D. Ground according to Division 16, Section “Grounding, Bonding & Surge Protective Devices”.

E. Provide wiring according to Division 16, Section “Conductors and Cables”.

F. Provide raceways according to Division 16, Section “Raceways and Boxes”.

END OF SECTION
SECTION 16442 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

C. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."

D. Field quality-control reports.
E. Panelboard schedules for installation in panelboards.

F. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

  1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Surface-mounted cabinets.

  1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: NEMA 250, Type 1

  2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

  3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.


  5. Type load type and location.

C. Incoming Mains Location: Top and bottom.
D. Phase, Neutral, and Ground Buses: Tin-plated aluminum.

E. Conductor Connectors: Suitable for use with conductor material and sizes.
   2. Main and Neutral Lugs: Compression type.
   3. Ground Lugs and Bus Configured Terminators: Compression type.
   4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Series rated panels are allowed only where the fault current indicated on the drawings and power system study cannot be achieved by fully rated equipment, such as the use of 20A single pole branch circuit breakers.

2.2 DISTRIBUTION PANELBOARDS

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

   1. General Electric Company

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike; hinged door and trim.

D. Branch Overcurrent Protective Devices: Bolt on.

2.3 LIGHTING APPLIANCE BRANCH-CIRCUIT, AND COLUMN TYPE PANELBOARDS

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

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike; door in door hinged trim.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

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

1. General Electric Company

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.


3. Where shown on schedules electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replaceable electronic trip; and the following field-adjustable settings:
   
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and I^2t response.

4. Where shown on schedules GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (5-mA trip).

5. Where shown on schedules Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).

6. Where shown on schedules Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

   a. Standard frame sizes, trip ratings, and number of poles.
b. Lugs: Compression or Mechanical style, suitable for number, size, trip ratings, and conductor materials.

c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

d. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, store and install panelboards and accessories according to NECA 407.

B. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

C. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

D. Install filler plates in unused spaces.

E. Arrange conductors in gutters into groups and bundle with tie wraps.

F. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 16 Section "Electrical Identification."

B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 16 Section "Electrical Identification."
D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 16 Section "Electrical Identification."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test each panelboard bus, component, connecting supply, feeder, and control circuit for shorts and grounds.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Report any unsatisfactory results to engineer.

END OF SECTION
SECTION 16491 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V AC and less for use in control circuits, enclosed switches, and enclosed controllers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

   a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
   b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.


4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit on translucent log-log graph paper.

5. Coordination charts and tables and related data.

B. Operation and Maintenance Data: To include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
Town of Sprague  
Public Works Equipment Storage Building  
Baltic Reservoir Access Road  
Sprague, Ct.

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit on translucent log-log graph paper.
4. Coordination charts and tables and related data.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single source from a single manufacturer to the extent possible.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. Littelfuse, Inc.
4. Gould
5. Equal approved by Engineer.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages, at class and current rating indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Motor Branch Circuits: Class RK5, time delay.
2. Other Branch Circuits: Class J, time delay.
3. Control Circuits: Class CC, time delay.
3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION
SECTION 16511 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Interior lighting fixtures with LED sources.
   2. Lighting fixtures mounted on exterior building surfaces with LED sources.
   3. Accessories, plaster rings, fasteners, etc.

1.2 RELATED DOCUMENTS:

A. The General Conditions, Supplementary Conditions, and applicable portions of Division 1 of the specification are part of this section which shall consist of all labor, equipment, materials and other costs necessary to complete all INTERIOR LIGHTING work indicated on the drawings, herein specified or both.

B. The applicable portions of section 16050 COMMON WORK RESULTS OF ELECTRICAL are hereby make a part of this section. It is important that you read that section carefully because it expands upon the requirements herein.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, and finishes.

B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 LIGHTING LUMINAIREs

A. See schedules on drawings.

B. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification Criteria. This does not require that the luminaire be listed on the DesignLights Consortium’s® Qualified Products List, but they must meet the Product Qualification Criteria. The technical requirements that the luminaire shall meet for each Application Category as currently defined by the DLC Premium qualification requirements at the time of bid.

C. Color Temperature of 3000K-4100K for interior luminaires as listed in the Luminaire Schedule on the plans. The color temperature of exterior LED luminaires should not exceed 4100K (nominal).

D. Color Consistency: LED manufacturer shall use a maximum 3-step MacAdam Ellipse binning process to achieve consistent luminaire-to-luminaire color for interior luminaires. Exterior luminaires shall use a maximum 5-step MacAdam Ellipse binning process.

E. Luminaire shall be mercury-free, lead-free, and RoHS compliant.

F. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.

G. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.

H. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.

I. Driver shall have a rated life of 50,000 hours, minimum.

J. Lumen output shall not depreciate more than 20% after 10,000 hours of use.

K. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
L. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior luminaires, and a minimum of 70 for exterior luminaires.

M. LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).

N. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.

O. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.

P. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.

Q. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.

R. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.

S. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing.

T. The LED luminaire shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).

U. Provide all of the following data on submittals:
   1. Delivered lumens
   2. Input watts
   3. Efficacy
   4. Color rendering index.

V. The failure of one LED shall not affect the operation of the remaining LEDs.

W. Emergency Inverters shall be sine-wave type, or have written confirmation from the luminaire manufacturer that the luminaire will function with a square-wave inverter.
2.3 **FIXTURE SUPPORT COMPONENTS**

A. Comply with Division 16 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).

**PART 3 - EXECUTION**

3.1 **INSTALLATION**

A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.

2. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

3. Provide additional support, independent of ceiling grid for all fixtures (including incandescent) by use of jack chain having breaking strength of 3 times the weight of the fixture (minimum of #12). Fixtures over one foot in length shall be supported at all four corners.

4. See section 260548, “Seismic Controls” for additional requirements.

C. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.


3. Continuous Rows (stem mounted): Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.


5. Support: Per NEC 410-16.

END OF SECTION
SECTION 16521 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Exterior luminaires and accessories
B. Poles
C. Pole foundations
D. Grounding
E. Conduit and wiring
F. Lighting controls

1.2 QUALITY ASSURANCE
A. Comply with the following codes and standards:
   1. National Electrical Code (NEC) for components and installation.
   2. International Building Code
   3. ASCE-7, Minimum Design Loads for Buildings and Other Structures
B. Provide luminaires listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environments in which installed.
C. Use manufacturers that are experienced in manufacturing poles, luminaires, lamps and ballasts similar to those indicated for this Project and have a record of successful in-service performance.

1.3 SERVICE CONDITIONS
A. Elevation: 7500 feet above sea level.
B. International Building Code and ASCE 7 design wind conditions:
   1. Basic Wind Speed: 130 mph (3-second gust at 30 ft above ground, mean recurrence interval of 50 years)
   2. Importance Factor: 1.00.
C. Ambient temperatures, deg C (deg F):
   1. Annual averages: 2.1 (35.8) minimum, 15.6 (60.0) maximum, 8.8 (47.9) average
   2. Annual nighttime average: 5.4 (41.7)
   3. Annual extremes: -15.0 (5.0) minimum, 31.7 (89.0) maximum
   4. Annual warmest day 24-hour average: 20.7 (69.3)
   5. Annual warmest day nighttime average: 16.4 (61.6).

D. Maximum solar heat gain: 110 W/sq ft.

E. Lightning flash density: 8 flashes to ground per square km per year.

1.4 DEFINITIONS
   A. Unless otherwise specified or indicated, terms used in this Section are as defined in the National Electrical Code or the IESNA Lighting Handbook.

1.5 SUBMITTALS
   A. Submit the following in accordance with Project submittal procedures.
      1. Catalog Data: Submit catalog data describing poles, luminaires, lamps, ballasts, and pole and luminaire finishes. Include data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of luminaire designation.
      2. Performance Curves/Data: Submit certified photometric data for each type of luminaire.
      3. Shop Drawings: Submit manufacturer's drawings for non-standard luminaires.
      4. Maintenance Data: Submit maintenance instructions for inclusion in the operations and maintenance manuals.

1.6 EXTRA MATERIALS
   A. Furnish the following extra materials matching products installed. Package with protective covering for storage and identify with labels describing contents.
      1. LED Luminaires: 10 percent of quantity of LED luminaires of each type, but no fewer than two of each type.
      2. Drivers: 10 percent of quantity of ballasts of each type, but not less than one of each type.
      3. Lenses, Diffusers, Covers, Globes, and Guards: 10 percent of quantity of each type, but not less than one of each type.
1.7 RECEIVING, STORING AND PROTECTING

A. Receive, inspect, handle, and store products according to the manufacturer’s written instructions and NECA/IESNA 501, Recommended Practice for Installing Exterior Lighting Systems.

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Alternate products may be accepted; follow Section 01 2500 Substitution Procedures.

2.2 FINISHES

A. Furnish luminaires, poles, and accessories with finishes as scheduled that are resistant to fading, chalking, and other changes due to aging and exposure to heat and ultraviolet light. Acceptable finishes for metals are:

1. Hot-dipped galvanized steel: ASTM A 123/A 123M.
2. Brushed natural aluminum
3. Anodized aluminum: AAMA 611, Anodized Architectural Aluminum, Class I.

B. Use stainless steel for exposed hardware.

2.3 EXTERIOR LUMINAIRES - GENERAL

A. Furnish exterior luminaires that comply with requirements specified in this Section and in the luminaire schedule on the Drawings.

B. Luminaires shall be NRTL-listed as conforming to to UL 1598 - Luminaires.

C. Luminaire photometric characteristics shall be based on IESNA approved methods for photometric measurements performed by a recognized photometric laboratory.

D. Luminaire housing shall be primarily metal.

1. Metal parts shall be free from burrs and sharp corners and edges.
2. Sheet metal components shall be fabricated from corrosion-resistant aluminum, formed and supported to prevent sagging and warping.
3. Exposed fasteners shall be stainless steel.
Town of Sprague  
Public Works Equipment Storage Building  
Baltic Reservoir Access Road  
Sprague, Ct.

E. Luminaires shall have minimum reflecting surface reflectance as follows unless scheduled otherwise:
   1. White surfaces: 85 percent
   2. Specular surfaces: 83 percent
   3. Diffusing specular surfaces: 75 percent

F. Provide lenses, diffusers, covers and globes as scheduled on the Drawings fabricated from materials that are UV stabilized to be resistant to yellowing and other changes due to aging or exposure to heat and ultraviolet radiation.

### 2.4 LED LUMINAIRES

A. LED luminaires shall conform to UL 1598 and to UL 8250 – *Safety Standard for Light-Emitting Diode (LED) Light Sources for Use in Lighting Products*.

B. Products shall be lead and mercury free.

C. Photometric characteristics shall be established using IESNA LM-79-08, *IESNA Approved Method for the Electrical and Photometric Measurement of Solid-State Lighting Products*.

D. Ingress protection for optical assembly shall be IP65 or better in accordance with ANSI/IEC 60529 - *Degrees of Protection Provided by Enclosures*.

E. Color characteristics of LED luminaires shall be as follows in accordance with ANSI C78.377 – *Specifications for the Chromaticity of Solid State Lighting Products*:
   1. Color temperature (deg K): 3000
   2. Color rendering index: not less than 80

F. LED and driver cooling system shall be passive and shall resist the buildup of debris.

G. LED luminaire output after 50,000 hours of operation shall be not less than 70 percent of the initial lumen output when determined in accordance with IESNA LM-80-08 – *IESNA approved Method for Measuring Lumen Maintenance of LED Lighting Sources*.

H. LED luminaire electrical characteristics:
   1. Supply voltage: 120 V, 208 V, 240 V, 277 V, or 480 V as indicated on the Drawings. Provide step-down transformers if required to match driver input voltage rating.
   2. Total harmonic distortion (current): Not more than 10 percent
   3. Power factor: Not less than 90%
4. RF interference: Meet FCC 47 CFR Part 15/18
5. Transient protection: IEEE C62.41 Class A.

I. Warranty:
   1. Manufacturer shall replace any luminaires that fail to operate properly within 60 months of the date of LANL acceptance of the installation. Lens yellowing or hazing will be considered a failure.
   2. Manufacturer shall replace any luminaires that experience housing or finish failure within 5 years of the date of acceptance of the installation.

J. Manufacturers: Subject to compliance with requirements, provide products as scheduled or specified on the Drawings.

2.5 LIGHTING CONTROL EQUIPMENT
   A. Furnish photoelectric relays to control exterior lighting as indicated on the Drawings.
   B. Furnish one or more time switches to control exterior lighting as indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine areas, spaces, and surfaces to receive exterior luminaire(s) or poles for compliance with installation tolerances and other conditions affecting performance of the product. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 INSTALLATION
   A. Install products in accordance with manufacturer's instructions, NECA/IESNA 501, and approved shop drawings.
   B. Locations of luminaires shown on the Drawings are diagrammatic. Coordinate luminaire locations with building finishes and building structure.
   C. Install surface mounted luminaires directly to an outlet box which is supported from structure.
3.4 GROUNDING
   A. Install grounding for exterior lighting using materials and methods specified in Section 26 0526, *Grounding and Bonding for Electrical Systems*.
   B. Connect ground lug of metal pole to circuit equipment grounding conductor.

3.5 RACEWAYS AND BOXES
   A. Install conduit system for exterior lighting using materials and methods specified in Section 26 0533, *Raceways and Boxes for Electrical Systems*.

3.6 BUILDING WIRE
   A. Install wiring for exterior lighting using materials and methods specified in Section 26 0519, *Low Voltage Electrical Power Conductors and Cables*.

3.7 FIELD QUALITY CONTROL
   A. Inspect each installed lighting unit for damage. Replace damaged luminaires, poles, and components.
   B. Test installed luminaires for proper operation.
      1. Provide instruments to make and record test results.
      2. Replace or repair malfunctioning luminaires and components then re-test.
      3. Repeat procedure until all luminaires operate properly.
   C. Replace inoperative lamps.
   D. Check poles for signs of vibration induced by 10 to 30 mph wind: visible swaying, loosened anchor bolt nuts, vibration perceptible by touch, or wires rattling inside pole. Notify the Engineer or Architect and the pole manufacturer – vibration mitigation devices may be required.

3.8 ADJUSTING AND CLEANING
   A. Clean each luminaire inside and out, including plastics and glassware. Use methods and materials recommended by manufacturer.

END OF SECTION
SUPPORT DOCUMENTS
Contents
Geotechnical Report
   Executive Summary
   Observed Conditions
   Summary of Recommendations
      Structural Foundations
      Equipment Slabs
      Pavements
   Structural Bearing Preparation
   Groundwater Characteristics
   Site Precautions
   Additional Site Characteristics
   Letter of Certification
Boring Logs
Location Plan
Geotechnical Report

Executive Summary

Existing Conditions: The soils on this site consist of a layer of mixed fill placed atop glacial deposit (sand or gravelly sand). There is intermittent debris in the fill, and the fill contains voids and extremely loose pockets. The underlying ledge (bedrock) was encountered at depths varying from 10.2 to 12.6 feet below grade; the bedrock is schist.

Recommendations: Strip all fill materials and topsoil, then build a spread footing foundation on native materials or structural fill. Alternatively, a deep foundation system may be installed through the fill to bear on the underlying rock directly. Parking lots may be built on low quality existing fill, while presuming short design life, at the owner’s discretion; see the Summary of Recommendation pavement section herein.

Observed Conditions

<table>
<thead>
<tr>
<th>Observed Soil Profile (Material type)</th>
<th>Maximum Ranges Observed (Depth in feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine to coarse Sand, little fine to medium Gravel, little Silt, and trace Organics; contains Blended Organic Loam, Cobbles/Ledge Fragments, Tree Fragments, Asphalt Debris, Rubble and Voids/Loose Pockets - VARIABLE UNSUITABLE FILL</td>
<td>0.0 to 12.6</td>
</tr>
<tr>
<td>Fine to coarse Sand, little fine to coarse Gravel, little Silt - Native Glacial Deposit</td>
<td>7.8 to 12.5</td>
</tr>
<tr>
<td>Bedrock/Ledge</td>
<td>10.2+</td>
</tr>
<tr>
<td>Groundwater Depth</td>
<td>5.0 to 10.0 ¹</td>
</tr>
<tr>
<td>Soil Expansion</td>
<td>Low</td>
</tr>
</tbody>
</table>

¹ See Groundwater Characteristics Section
Summary of Recommendations

Structural Foundations

Our office recommends that structural foundations be designed as normal spread footings, bearing atop either improved native material (stripped of unsuitables) or structural fill, prepared per the Structural Bearing Preparation Section. Our office recommends that an allowable bearing capacity of 4000 psf be used for design. As an alternative, the foundation may be designed to bear on deep foundation elements passing through the unsuitable fill and bearing directly on the underlying bedrock. These deep elements are typically driven ductile iron piles (D.I.P.s), helical piers, micro-piles, pre-cast piles, wooden piles, cast piers, caissons, or rammed aggregate piles (R.A.P.s). The most cost effective systems are likely to be D.I.P.s, helical piers, driven wood/steel piles, or R.A.P.s. A deep foundation should be pursued as an option for cost savings, with the understanding that the slab must be similarly supported. If a vibration inducing system (such as wood piles) is used, review the Site Precautions section prior to proceeding.

Equipment Slabs

Equipment slabs may be designed as conventional concrete slab-on-grade construction, in areas prepared per the Structural Bearing Preparation Section including stripping of unsuitables. A 12” layer of free draining structural fill is recommended directly beneath the slab-on-grade.

Pavements

Our pavement recommendations should be taken as minimum criteria advised for use by the designer. In areas of main drives and loading zones, asphaltic concretes may be comprised of 1 ½” top course and 2 ½” binder course over a 10” base course. In areas of passenger vehicle drives and parking, asphaltic concretes may be comprised of 1 ½” top course and 1 ½” binder course over an 8” base course. In any areas, a 12” layer of A-1-a (AASHTO) or Structural Fill subbase material is recommended. The recommended subgrade is to be native subgrade (stripped of unsuitables) or structural fill, prepared per the Structural Bearing Preparation Section.

At the owner’s discretion, the removal and replacement of marginal materials beneath passenger vehicle drives and parking areas may be omitted, presuming that the pavement will have a lower design life. If this option is considered, our office recommends that a minimum of 24” be stripped below proposed bottom of asphalt, the area be proof rolled, and a layer of biaxial geo-grid be installed prior to placing free-draining subgrade (specified by designer). Additionally, our office recommends that the layer of subgrade be pitched (1/8” per foot minimum recommended) for positive drainage.
Structural Bearing Preparation

Prior to use of any soil for structural bearing, any layers containing topsoil/organics/loam, excessive root material, wood, debris/rubbish, or voids must be removed and replaced with structural fill as called out in this section (EPS/Geofoam or Flowable Fill are acceptable alternative fill materials). Once the site has been excavated to the required grade, any disturbed soil at the bottom of excavation must be proof compacted with vibratory compaction equipment prior to commencement of construction. A soils engineer or their representative should be present during compaction operations to ensure that proper compaction takes place and to watch for any unusual settlement in the soil, which can be a sign of the presence of weak soil layers. If vibratory compaction causes pumping of water resulting in saturation of fines/tight soils, see the Groundwater Characteristics section.

Once the site has been excavated of any unsuitable soils and prepared as described above, it is recommended that the desired grade be achieved by placing granular soil in lifts acceptable given the equipment and compacting the soil to 95 percent of its maximum dry density as determined by ASTM D-1557 (three point curve acceptable). The native and/or reprocessed materials may be used as fill, provided that they meet the criteria listed below. Reprocessing of on-site structures is acceptable. Reprocessed material may not contain more than 10% brick fragments or more than 30% concrete fragments. The soil may contain up to 10% reclaimed/reprocessed asphalt if and only if the percentage of soil passing the #200 sieve is reduced to 5%. Please note that these reprocessed materials may cause compaction testing issues when using nuclear densometers. The soil shall be free of organics, wood/roots, debris and hazardous material, and must conform to the following gradation:

<table>
<thead>
<tr>
<th>Structural Fill</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot;</td>
<td>100</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>85-100</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>50-85</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>40-80</td>
</tr>
<tr>
<td>#4</td>
<td>30-75</td>
</tr>
<tr>
<td>#40</td>
<td>0-40</td>
</tr>
<tr>
<td>#200</td>
<td>0-10*</td>
</tr>
</tbody>
</table>

*5% if reprocessed asphalt is used.

Alternatively, a washed crushed filter stone, free of debris, meeting the following gradation may be placed in 6" lifts and compacted with a 10 ton vibratory roller until firm. This alternative may be a superior option if wet conditions are encountered or anticipated per the Groundwater Characteristics section, but should be capped or otherwise solidified prior to being used as aggregate base below asphalt in order to achieve a stable working surface:

<table>
<thead>
<tr>
<th>Filter Stone</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot;</td>
<td>100</td>
</tr>
<tr>
<td>3&quot;</td>
<td>55-100</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>30-100</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>20-60</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>15-45</td>
</tr>
<tr>
<td>#4</td>
<td>10-35</td>
</tr>
<tr>
<td>#40</td>
<td>0-5</td>
</tr>
</tbody>
</table>
**Groundwater Characteristics**

Static groundwater was encountered at 5.0 to 10.0 feet below grade at the time of the excavation. The 5.0' measurement is presumed to be isolated perched water. The static water table should be expected to rise during wet periods. Additionally, the low permeability of the substrata is likely to cause sharp variation subsequent to storm events, quite likely creating surface water and saturation of upper stratum. Capillary action is likely to draw moisture 18 to 36 inches above the water table and/or below perched water tables in the silty layers, resulting in moisture concerns at all depths during wet weather. It is likely that there are channels within or over the low permeability glacial till/bedrock through which high volumes of flow occur during storm events. Without direct testing of any given location, the native material should not be relied upon for percolation.

Due to the low permeability of some of the on-site soils, excavations should be sloped to a sump area, and sump pumps may be required to dewater the site subsequent to storm events. Additionally, if soil becomes too saturated to compact, all excavations may be over-excavated 1'-0" and backfilled with one 3" lift of 1-1/2" washed crushed stone; this lift of stone must be compacted with a heavy plate compactor until firm, which will drive the stone into the underlying soil. In any areas where this first lift of stone is completely driven into the soft, moist material, additional lifts of similarly sized stone are to be placed until the stone withstands compaction efforts without completely subsiding. Once this level of stability is achieved, a 6" lift of either ½" to ¾" crushed stone or filter stone is to be placed over the larger stone and similarly compacted. Neither of these lift depths are to be exceeded, as thicker lifts will not be able to be driven into the underlying material with the recommended equipment. If different compaction equipment is to be used, a written recommendation of stone size and lift size is to be obtained from our office. If working in the fine/silt layers, as a preventative measure, prior to placement of structural fill, our office recommends over-excavating and installing a 6" (minimum) layer of either washed stone or structural fill so as to avoid saturation issues.

Any and all soil operations should be overseen by a soils engineer (or his representative) employed by the owner to ensure that the foundation stability has been obtained and prepared as per this geotechnical report.

**Site Precautions**

Any undermining of adjacent structures and/or utilities likely to be incurred by construction activities shall be prevented by shoring or underpinning at the discretion of the contractor, and with the agreement of the owners of said structures. Any mechanical (impact) damage or vibration damage (such as might be caused by ledge removal or blasting) likely to be caused to neighboring structures/utilities is to be identified by the contractor (or his rep.) and prevented via shielding, debris mitigation, or other approved methods which are found to be agreeable with the owner of the neighboring structure. All construction activities are to be in complete accordance with OSHA and IBC/State B.C. regulations; specifically 1990 OSHA sections: .900 -.914, .650 -.652, .800, .550; and 2012 IBC Section 1804: “Excavation, Grading and Fill”, or the relevant sections of more updated codes. Digsafe is to be contacted, and a digsafe/CBYD number acquired prior to excavation.
Additional Site Characteristics

<table>
<thead>
<tr>
<th>Seismic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Seismic Site Coefficients $S_s$</td>
<td>0.171</td>
</tr>
<tr>
<td>$S_1$:</td>
<td>0.061</td>
</tr>
<tr>
<td>Seismic Site Classification</td>
<td>D</td>
</tr>
<tr>
<td>Frost Protection</td>
<td></td>
</tr>
<tr>
<td>State Requirement Without Protection</td>
<td>3'-6&quot;</td>
</tr>
<tr>
<td>Soil Design Parameters</td>
<td></td>
</tr>
<tr>
<td>Cohesion value</td>
<td>0, Cohesionless Behavior</td>
</tr>
<tr>
<td>Approximate Soil Unit Weights</td>
<td>Dry=115 to 138 pcf (varying with material)</td>
</tr>
<tr>
<td>Allowable Lateral Bearing Capacity</td>
<td>200 psf for all layers</td>
</tr>
<tr>
<td>Subgrade Modulus</td>
<td>300 pci (in prescribed fill)</td>
</tr>
<tr>
<td>Coefficients of Friction:</td>
<td></td>
</tr>
<tr>
<td>Soil to Concrete Contact</td>
<td>0.6</td>
</tr>
<tr>
<td>Ledge to Concrete Contact</td>
<td>0.7</td>
</tr>
<tr>
<td>Recommended Factor of Safety for Sliding</td>
<td>1.5, 1.1 for seismic design</td>
</tr>
<tr>
<td>Design Internal Friction Angle</td>
<td>34 degrees (in glacial deposit or structural fill)</td>
</tr>
<tr>
<td>Rankine Pressure Values with No Slope, Batter, Surcharge or Vibration (not accounting for Pore Pressure or Hydrostatic Pressure)</td>
<td>$K_o=0.283; \ K_o=0.441; \ K_r=3.53; \ K_{ae}=0.53; \ K_{sur}=K_o \ or \ K_o$</td>
</tr>
<tr>
<td>OSHA Soil Type</td>
<td>B (areas other than stable cut crystalline bedrock)</td>
</tr>
<tr>
<td>Allowable Excavation Slope</td>
<td>1:1 (45 degree)</td>
</tr>
<tr>
<td>Soil Permeability</td>
<td>Very Slow to Moderate in topsoil and fill, Very Slow in substrata.</td>
</tr>
<tr>
<td>Recommended Slope</td>
<td>Without erosion mitigation, slopes should be less than 14 degrees (1-Vertical : 4-Horizontal). With erosion mitigation, slopes should be less than 27 degrees (1-Vertical : 2-Horizontal)</td>
</tr>
</tbody>
</table>

Letter of Certification

Our office certifies that the information in this report is correct and accurate to the extent current exploration makes possible. Localized variations not intersected by current exploration could deviate from the conditions summarized in this report. If deviation is found, our office is to be consulted.

If you have any questions, or should you require any additional information, please do not hesitate to contact our office.

Sincerely,

CLA Engineers, Inc.

Asa Bender, PE
Geo-Structural Engineer

2/7/17
Boring Logs
<table>
<thead>
<tr>
<th>DEPTH BELOW SURFACE</th>
<th>CASING BLOWS PER FOOT</th>
<th>SAMPLE NO DEPTHS</th>
<th>TYPE OF SAMPLE</th>
<th>PENETRATION BLOWS PER 2 INCHES</th>
<th>DENSITY OR CONSIST</th>
<th>PROFILE CHANGE DEPTH</th>
<th>FIELD IDENTIFICATION OF SOILS, REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A</td>
<td>0-2.0</td>
<td>D-1</td>
<td>1-1-2-8</td>
<td>VERY LOOSE</td>
<td></td>
<td>F-M DK REDDISH-BR SAND, LITTLE F-M GRAVEL, little silt, asphalt, tree wood and LOAM-FILL.</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>REFUSAL ON AUGERS - 12.5'</td>
</tr>
<tr>
<td>-10</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>INSTALLED 12.5' OF 2&quot; M.W. PIPE W/5.0' SCREEN AS O.W.</td>
</tr>
<tr>
<td>-20</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-30</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-40</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Types of Sample**
- D = Dry
- C = Clay
- W = Washed
- U = Undisturbed
- T = Tapered
- A = Auger
- US = Undisturbed Soil
- V = Vent Test

**Penetration Resistance**
- Earth Boring
- Rock Coring

**Cohesion vs. Density**
- Cohesion
  - Very Loose
  - Loose
  - Very Soft
  - Soft
- Density
  - Med Dense
  - Dense
  - Very Dense
  - Hard

**Notes**
- 140 lb. Wt. Falling 30' on 2" O.D. Sampler
- 100 ft. Fall on 6" O.D. Sampler
<table>
<thead>
<tr>
<th>Depth Below Surface</th>
<th>Casing No. B/Blows Per Foot</th>
<th>Sample No.</th>
<th>Type of Sample</th>
<th>Penetration B/Blows Per 5 Inches</th>
<th>Density or Consist</th>
<th>Profile Change Depth</th>
<th>Field Identification of Soils, Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A 0-2.0 D-1 1-1-9-3</td>
<td>MED.</td>
<td>F-M DK REDDISH-BR SAND, LITTLE F-M GRAVEL, little silt, asphalt, tree wood and LOAM-FILL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>U</td>
<td>DENSE</td>
<td>F-M DK BR SAND, LITTLE F-M GRAVEL, little silt, asphalt, tree wood and LOAM-FILL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E</td>
<td></td>
<td>F-M LT BR SAND, TR OF C SAND, little silt, some lgr rock fragments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-10</td>
<td>S 5-7.0 D-2 1-0-1-5</td>
<td>VERY LOOSE</td>
<td>7.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-10.2 D-3 120/3&quot;</td>
<td>DENSE</td>
<td>10.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Refusal on Spoon/Augers - 10.2'
### Field Identification of Soils, Remarks

- **A**: D-1, 12/18-12/8, Dense
- **U**: LOOSE
- **G**: 7.8
- **E**: 10.5
- **R**: 10-10.5, D-3, 12/6" very dense
- **S**: 5-7.0, D-2, 1-0-5-7

**Remarks Include Color, Gradation, Type of Soil, etc.**

- **F-M DK BR-LT BR SAND, TR OF C SAND, LITTLE**
- **F-M GRAVEL, tr of silt, little tree wood and LOAM-FILL**
- **F-M DK BR SAND, TR OF C SAND, LITTLE**
- **F-M GRAVEL, tr of silt, little tree wood and LOAM-FILL**
- **F-M LT GR SAND, TR OF C SAND, LITTLE F-C GRAVEL, little silt**

**Refusal on Spoon/Augers**: 10.5'
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>CASING BLOWS PER FOOT</th>
<th>SAMPLE NO</th>
<th>TYPE OF SAMPLE</th>
<th>PENETRATION BLOWS PER 8 INCHES</th>
<th>DENSITY OR CONSIST</th>
<th>PROFILE</th>
<th>DENSITY DEPTH</th>
<th>FIELD IDENTIFICATION OF SOILS, REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0</td>
<td>A</td>
<td>0-2.0</td>
<td>D-1</td>
<td>3-1-6-2</td>
<td>LOOSE</td>
<td>F-M DK BR SAND, LITTLE F-M GRAVEL, little silt, asphalt, tree wood and LOAM-FILL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>U</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-10</td>
<td>S</td>
<td>5-7.0</td>
<td>D-2</td>
<td>1-2-0-3</td>
<td>VERY LOOSE</td>
<td>12.6</td>
<td>some rock fragments-fill</td>
<td></td>
</tr>
<tr>
<td>-20</td>
<td>R</td>
<td>10-12.0</td>
<td>D-3</td>
<td>2-3-3-42</td>
<td>LOOSE</td>
<td></td>
<td></td>
<td>REFUSAL ON AUGERS - 12.6</td>
</tr>
</tbody>
</table>

**Ground Surface to 12.6 ft used Augers: Casing: Then Refusal on Augers: Hole No. B-4**

- **Type of Sample:**
  - D = Dry
  - O = Gravel
  - W = Washed
  - U = Undisturbed
  - TP = Test Pit
  - A = Auger
  - US = Undisturbed Shelly
  - V = Vane Test

- **Penetration Resistance:**
  - 140 lb, VA, falling 30° on 2" O.D. Sampler

- **Consistency:**
  - Very Loose
  - Loose
  - Medium Dense
  - Dense
  - Very Dense
  - Hard

- **Earth Boaring:**
  - 12.6' Rock Coating

- **Samples:**
  - D-3
Location Plan
PREVAILING WAGE DOCUMENTS
(RATES TO BE ISSUED AS AN ADDENDUM)