

# **Project Manual and Specifications**

## **Town of Voluntown Public Works Garage**

**Prepared for the  
Town of Voluntown, 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

**September 2016  
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## TABLE OF CONTENTS

- I. INVITATION TO BID
- II. REQUIRED DOCUMENTS – LIST OF BID REQUIREMENTS
- III. BONDING AND INSURANCE REQUIREMENTS
- IV. PROJECT SIGN
- V. INSTRUCTIONS TO BIDDERS (EJCDC C-200)
- VI. BID PROPOSAL FORMS
  - 1. BID FORM (EJCDC C-410)
  - 2. FORM OF BID BOND (EJCDC C-430)
  - 3. CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY
  - 4. PROPOSED SUBCONTRACTORS
  - 5. PROPOSED SUPPLIERS
  - 6. STATEMENT OF BIDDERS QUALIFICATIONS
  - 7. CERTIFICATE AS TO CORPORATE PRINCIPAL
  - 8. NON-DISCRIMINATION IN EMPLOYMENT
  - 9. NON-COLLUSION AFFIDAVIT OF PRIME BIDDER
  - 10. CHRO CONTRACT COMPLIANCE REGULATIONS NOTIFICATION TO BIDDERS
  - 11. INSTRUCTIONS AND OTHER INFORMATION
  - 12. BIDDER CONTRACT COMPLIANCE MONITORING REPORT
    - a. PART I – BIDDER INFORMATION
    - b. PART II – BIDDER NONDISCRIMINATION POLICIES AND PROCEDURES
    - c. PART III – BIDDER SUBCONTRACTING PRACTICES
    - d. PART IV – BIDDER EMPLOYMENT INFORMATION
    - e. PART V – BIDDER HIRING AND RECRUITMENT PRACTICES
  - 13. CONTRACTOR’S MINORITY BUSINESS ENTERPRISES UTILIZATION FORM
  - 14. AFFIDAVIT MINORITY BUSINESS ENTERPRISES
  - 15. CERTIFICATE OF COMPLIANCE WITH CT GENERAL STATUTE SEC 31-57b
  - 16. GENERAL CONTRACTOR FINAL AFFIDAVIT WAIVER OF LIEN
  - 17. SUBCONTRACTOR/SUPPLIER FINAL AFFIDAVIT WAIVER OF LIEN
- VII. AGREEMENT AND BOND FORMS
- VIII. STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT (EJCDC C-700)
- IX. SUPPLEMENTARY CONDITIONS
  - 1. NOTICE OF AWARD (EJCDC C-510)
  - 2. FORM OF AGREEMENT (EJCDC C-520)
  - 3. FORM OF PERFORMANCE (EJCDC C-610)
  - 4. FORM OF PAYMENT BOND (EJCDC C-615A)
  - 5. NOTICE TO PROCEED (EJCDC C-550)
  - 6. FORM OF CONTRACTORS APPLICATION FOR PAYMENT (EJCDC C-620)
  - 7. FORM OF CHANGE ORDER(EJCDC C-941)
  - 8. FORM OF CERTIFICATE OF SUBSTANTIAL COMPLETION (EJCDC C-625)
- X. TECHNICAL SPECIFICATIONS
- XI. PREVAILING WAGE DOCUMENTS

# INVITATION TO BID

## **INVITATION TO BID**

Sealed bids for furnishing all labor, materials, tools, services and equipment necessary to complete the **“VOLUNTOWN PUBLIC WORKS GARAGE”** will be received at the office of the First Selectmen, Town Hall, 115 Main Street, Voluntown, Connecticut 06384, until 10:00 PM on May 9, 2018 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 garage located on Gates Street in Voluntown. 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.

A mandatory pre-bid meeting will be held at the project site (at the north end of Gate Street) on April 25, 2018 at 10:00 AM.

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 Voluntown 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 Voluntown 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.

Bid Documents are available digitally only and can be found on the Town of Voluntown website: <http://www.voluntown.gov/>. 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 90 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

This contract is subject to state set-aside and contract compliance requirements.

First Selectman, Town of Voluntown

## **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

**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 Andover 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.

# DEPARTMENT OF ECONOMIC AND COMMUNITY DEVELOPMENT

## PROJECT SIGN – ECONOMIC & COMMUNITY DEVELOPMENT

8'-0"

4'-0"



NAME OF THE PROJECT



NAME OF THE SPONSOR/DEVELOPER

Constructed in cooperation with the

STATE OF CONNECTICUT  
DANNEL P. MALLOY, GOVERNOR

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

and the  
Name of Town/City  
Name of Chief Elected Official and title

Name of Architect

Name of General 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.

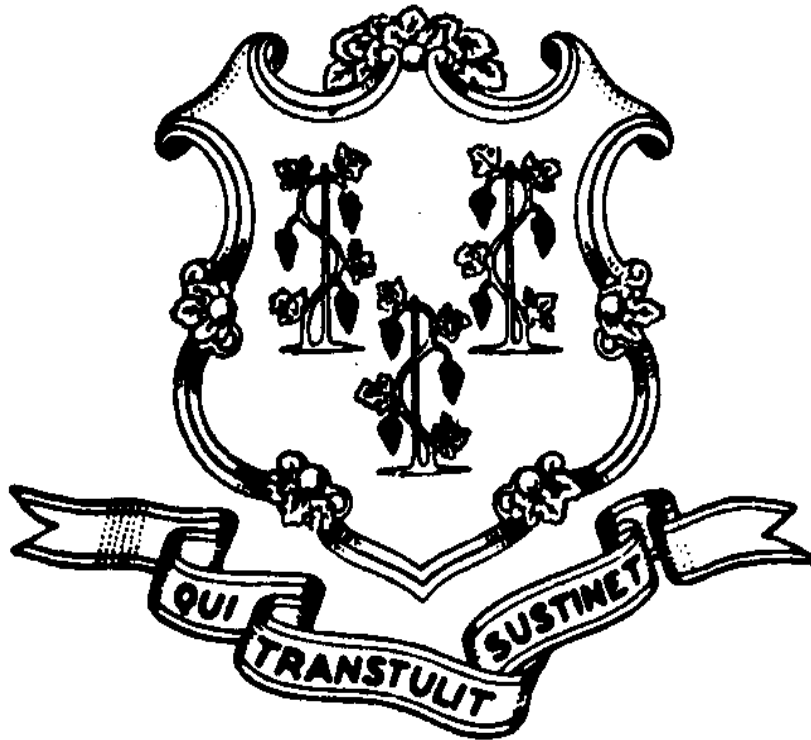
**TYPEFACE:** HELVETICA MEDIUM

**LOCATION:** SIGN MUST BE LOCATED TO BE CLEARLY VISIBLE TO THE PUBLIC.

**TIMING:** INSTALL AT THE START OF CONSTRUCTION AND REMOVE AT CONSTRUCTION COMPLETION.

**STATE SEAL & DECD LOGO:** ATTACHED

STATE SEAL



DECD LOGO

Connecticut   
*still revolutionary*

# **INSTRUCTIONS TO BIDDERS**

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1420 King Street, Alexandria, VA 22314-2794  
(703) 684-2882  
[www.nspe.org](http://www.nspe.org)

American Council of Engineering Companies  
1015 15th Street N.W., Washington, DC 20005  
(202) 347-7474  
[www.acec.org](http://www.acec.org)

American Society of Civil Engineers  
1801 Alexander Bell Drive, Reston, VA 20191-4400  
(800) 548-2723  
[www.asce.org](http://www.asce.org)

Associated General Contractors of America  
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308  
(703) 548-3118  
[www.agc.org](http://www.agc.org)

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## TABLE OF CONTENTS

|  | Page |
|--|------|
| Article 1 – Defined Terms.....   | 1    |
| Article 2 – Copies of Bidding Documents.....                                     | 1    |
| Article 3 – Qualifications of Bidders .....                                      | 1    |
| Article 4 – Examination of Bidding Documents, Other Related Data, and Site ..... | 1    |
| Article 5 – Pre-Bid Conference.....  | 3    |
| Article 6 – Site and Other Areas .....   | 3    |
| Article 7 – Interpretations and Addenda.....                                     | 3    |
| Article 8 – Bid Security .....   | 3    |
| Article 9 – Contract Times .....   | 4    |
| Article 10 – Liquidated Damages .....  | 4    |
| Article 11 – Substitute and “Or-Equal” Items .....                               | 4    |
| Article 12 – Subcontractors, Suppliers and Others.....                           | 5    |
| Article 13 – Preparation of Bid .....  | 5    |
| Article 14 – Basis of Bid; Comparison of Bids .....                              | 6    |
| Article 15 – Submittal of Bid .....  | 6    |
| Article 16 – Modification and Withdrawal of Bid .....                            | 7    |
| Article 17 – Opening of Bids .....   | 7    |
| Article 18 – Bids to Remain Subject to Acceptance .....                          | 7    |
| Article 19 – Evaluation of Bids and Award of Contract .....                      | 7    |
| Article 20 – Contract Security and Insurance.....                                | 8    |
| Article 21 – Signing of Agreement.....   | 8    |
| Article 22 – Sales and Use Taxes.....  | 9    |
| Article 23 – Retainage .....   | 9    |
| Article 24 – Employment of Labor .....   | 9    |
| Article 25 – Provisional Items.....  | 10   |
| Article 26 – Safety Standards.....   | 10   |
| Article 27 – State of Connecticut Set-Aside requirements .....                   | 10   |



## **ARTICLE 1 – DEFINED TERMS**

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office* – The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered. *In this case the Town of Voluntown Selectman Office located at 115 Main Street, Voluntown Connecticut.*

## **ARTICLE 2 – COPIES OF BIDDING DOCUMENTS**

- 2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the advertisement or invitation to bid may be obtained from the *locations stated in the advertisement.*
- 2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

## **ARTICLE 3 – QUALIFICATIONS OF BIDDERS**

- 3.01 To demonstrate Bidder's qualifications to perform the Work, within 5 days of Owner's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be called for below.
- A. *Evidence of Bidder's authority to do business in the State of Connecticut.*
- B. *List of major equipment available for this contract.*
- 3.02 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

## **ARTICLE 4 – EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE**

- 4.01 Not Applicable
- 4.02 Underground Facilities
- A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

- 4.03 Not Applicable
- 4.04 Not Applicable
- 4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates. *The Bidder must perform these investigations within the bid advertisement period and at a time at the discretion of the Owner.*
- 4.06 Not Applicable
- 4.07 It is the responsibility of each Bidder before submitting a Bid to:
- A. examine and carefully study the Bidding Documents, and the other related data identified in the Bidding Documents;
  - B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
  - C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;
  - D. Not Applicable
  - E. Not Applicable
  - F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;
  - G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
  - H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and
  - I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given

Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

## **ARTICLE 5 – PRE-BID CONFERENCE**

- 5.01 A mandatory pre-bid conference will be held at 10:00 a.m. local time on April 25, 2018 at the project site (at the north end of Gate Street). Representatives of Owner and Engineer will be present to discuss the Project. Bidders are required to attend the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

## **ARTICLE 6 – SITE AND OTHER AREAS**

- 6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

## **ARTICLE 7 – INTERPRETATIONS AND ADDENDA**

- 7.01 *Any questions regarding specifications, policies and procedures are to be directed to the Project Engineer. Interpretations or clarifications considered necessary in response to such questions will be issued by Addenda. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.*
- 7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.
- 7.03 *Potential Bidders are responsible for checking the Town of Waterford website at <http://www.voluntown.gov/> for any addendums and updates regarding this Bid.*

## **ARTICLE 8 – BID SECURITY**

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price and in the form of a certified check, bank money order, or a Bid bond (on the form attached) issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.
- 8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of

Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or **121** days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

- 8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

## **ARTICLE 9 – CONTRACT TIMES**

- 9.01 The number of days within which the Work is to be substantially completed and ready for final payment is set forth in the Agreement.

## **ARTICLE 10 – LIQUIDATED DAMAGES**

- 10.01 Provisions for liquidated damages are set forth in the Agreement.

## **ARTICLE 11 – SUBSTITUTE AND “OR-EQUAL” ITEMS**

- 11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or those substitute or “or-equal” materials and equipment approved by Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function and quality to be met by any proposed substitute or “or-equal” item. No item of material or equipment will be considered by Engineer as a substitute or “or-equal” unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each such request shall conform to the requirements of Paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

## **ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS AND OTHERS**

- 12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, without an increase in the Bid.
- 12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.
- 12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

## **ARTICLE 13 – PREPARATION OF BID**

- 13.01 The Bid Form is included with the Bidding Documents. Additional copies may be obtained from the Engineer.
- 13.02 All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each part of the Bid Proposal, bid item, and unit price item listed therein.
- 13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.
- 13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.
- 13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.

- 13.06 A Bid by an individual shall show the Bidder's name and official address.
- 13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.
- 13.08 All names shall be printed in ink below the signatures.
- 13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.10 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- 13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

#### **ARTICLE 14 – BASIS OF BID; COMPARISON OF BIDS**

##### **14.01 Lump Sum**

- A. Bidders shall submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate. In the comparison of Bids, alternates will be applied in the same order as listed in the Bid form.
- B. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

##### **14.02 Allowances**

- A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 11.02.B of the General Conditions.

#### **ARTICLE 15 – SUBMITTAL OF BID**

- 15.01 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and all of the attachments outlined in Article 7 of the Bid Form
- 15.02 Sealed Bids **(One Original & Three Copies)** shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title, bid number, time of bid opening and

date, the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to the *Selectman Office, Town of Voluntown, 115 Main Street, Voluntown, CT 06384*, and must arrive prior to the date and time of Bid Opening.

- 15.03 *If at any time of the scheduled Bid opening, Town Hall or the Office of Procurement is closed due to uncontrolled events such as fire, snow, ice, wind or building evacuation, the Bid opening will be postponed until 2:00 p.m. the next business day. Proposals will be accepted until that date and time. Bidders/Proposers are advised to check the Town Web site for information.*
- 15.04 *The bidder agrees and warrants that in the submission of this sealed bid, they 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 bidder that such disability prevents performance of that which must be done to successfully fulfill the terms of this sealed bid or in any manner which is prohibited by the laws of the United States or the State of Connecticut: and further agrees to provide the Human Relations Commission with such information requested by the Commission concerning the employment practices and procedures of the bidder. An Affirmative Action Statement will be required by the successful bidder.*

## **ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID**

- 16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids or authorized postponement thereof.
- 16.02 Not Applicable

## **ARTICLE 17 – OPENING OF BIDS**

- 17.01 Bids will be opened at the time and place indicated in the Advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

## **ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE**

- 18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

## **ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT**

- 19.01 Owner reserves the right to reject any or all Bids or any part of any Bid, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes

that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

- 19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.
- 19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- 19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.
- 19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work in accordance with the Contract Documents.
- 19.06 If Contract is to be awarded, Owner will award the Contract to the responsible Bidder who's Bid, conforming with all the material terms and conditions of the Instructions to Bidders, is lowest, price and other factors considered. If detailed in the bid form, factors such as discounts, transportation costs, and life cycle costs may be used to determine which bidder, if any, is to be offered the award.
- 19.07 *Town reserves the right to award in part, to reject any and all, in whole or in part, for misrepresentation or if the respondent is in default of any prior Town contract, or if the Respondent limits or modifies any of the terms and conditions and/or specifications of the Request The Town also reserves the right to waive technical defects, irregularities and omissions if, in its judgment, the best interest of the Town will be served.*

## **ARTICLE 20 – CONTRACT SECURITY AND INSURANCE**

- 20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds.

## **ARTICLE 21 – SIGNING OF AGREEMENT**

- 21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement along with the other Contract Documents which are identified in the Agreement as attached thereto. Within 15 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement



and attached documents to Owner. Within ten days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

## **ARTICLE 22 – SALES AND USE TAXES**

- 22.01 Owner is exempt from Connecticut state sales and use taxes on materials and equipment to be incorporated in the Work. (Exemption Number will be provided after execution of the agreement). Said taxes shall not be included in the Bid. Refer to Paragraph 6.10 of the Supplementary Conditions for additional information.

## **ARTICLE 23 – RETAINAGE**

- 23.01 Provisions concerning Contractor's rights to deposit securities in lieu of retainage are set forth in the Agreement.

## **ARTICLE 24 – EMPLOYMENT OF LABOR**

- 24.01 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 Voluntown 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 195S, as amended.

- 24.02 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 \$1,000,000.

**All Bidders are informed that the project is considered NEW construction.**

- 24.03 All Bidders are advised to inform themselves and to comply with the requirements of Federal, State and local laws governing the employment of labor.
- 24.04 The Contractor shall provide certified payroll sheets to the Owner which include all employees involved with the project for each payroll period during the course of the project.

## **ARTICLE 25 – PROVISIONAL ITEMS**

- 25.01 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 26 – SAFETY STANDARDS**

- 26.01 Bidder agrees to comply with all of the latest Federal and State Safety Standards and Regulations and certifies that all work required in this bid will conform to and comply with said standards and regulations. Bidder further agrees to indemnify and hold harmless the Town for all damages assessed against the Town as a result of Bidder's failure to comply with said standards and/or regulations.

## **ARTICLE 27 – STATE OF CONNECTICUT SET-ASIDE REQUIREMENTS**

- 27.01 The contractor who is selected to perform this State project must comply with CONN. GEN. STAT. §§ 4a-60, 4a-60a, 4a-60g, and 46a-68b through 46a-68f, inclusive, as amended by June 2015 Special Session Public Act 15-5.

State law requires a minimum of twenty-five (25%) percent of the state-funded portion of the contract for award to subcontractors holding current certification from the Connecticut Department of Administrative Services (“DAS”) under the provisions of CONN. GEN. STAT. § 4a-60g, as amended. (25% of the work with DAS certified Small and Minority owned businesses and 25% of that work with DAS certified Minority, Women and/or Disabled owned businesses.) The contractor must demonstrate good faith effort to meet the 25% set-aside goals.

For municipal public works contracts and quasi-public agency projects, the contractor must file a written or electronic non-discrimination certification with the Commission on Human Rights and Opportunities. Forms can be found at:

[http://www.ct.gov/opm/cwp/view.asp?a=2982&q=390928&opmNav\\_GID=1806](http://www.ct.gov/opm/cwp/view.asp?a=2982&q=390928&opmNav_GID=1806)

## **BID PROPOSAL FORMS**

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1420 King Street, Alexandria, VA 22314-2794  
(703) 684-2882  
[www.nspe.org](http://www.nspe.org)

American Council of Engineering Companies  
1015 15th Street N.W., Washington, DC 20005  
(202) 347-7474  
[www.acec.org](http://www.acec.org)

American Society of Civil Engineers  
1801 Alexander Bell Drive, Reston, VA 20191-4400  
(800) 548-2723  
[www.asce.org](http://www.asce.org)

Associated General Contractors of America  
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308  
(703) 548-3118  
[www.agc.org](http://www.agc.org)

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# **BID FORM**

**Town of Voluntown  
BOARD OF SELECTMEN**

**Town of Voluntown Public Works Garage**

## TABLE OF CONTENTS

|   | Page |
|---|------|
| Article 1 – Bid Recipient .....             | 1    |
| Article 2 – Bidder’s Acknowledgements ..... | 1    |
| Article 3 – Bidder’s Representations .....  | 1    |
| Article 4 – Bidder’s Certification .....    | 2    |
| Article 5 – Basis of Bid .....              | 3    |
| Article 6 – Time of Completion .....        | 18   |
| Article 7 – Attachments to This Bid .....   | 18   |
| Article 8 – Defined Terms .....             | 18   |
| Article 9 – Bid Submittal .....             | 19   |

## ARTICLE 1 – BID RECIPIENT

- 1.01 This Bid is submitted to:  
**Selectman Office**  
**Town of Voluntown**  
**115 Main Street**  
**Voluntown, CT 06384**
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

## ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

- 2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

## ARTICLE 3 – BIDDER’S REPRESENTATIONS

- 3.01 In submitting this Bid, Bidder represents that:
- A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.

Addendum Date

|       |       |
|-------|-------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

- B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Not Applicable
- E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and drawings identified in the

- Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
  - G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
  - H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
  - I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

#### **ARTICLE 4 – BIDDER'S CERTIFICATION**

4.01 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
  - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
  - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;



3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

## **ARTICLE 5 – BASIS OF BID**

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

**Unit prices 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. Public Works Garage:**

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 including office, garage and mezzanine.
- C. All interior utilities including mechanical, plumbing, electrical, security and communication systems.
- D. All interior framing and finishes.
- E. Generator

LUMP SUM PRICE: \_\_\_\_\_

LUMP SUM PRICE IN WORDS: \_\_\_\_\_

---

**2. Public Works Garage Site Work:**

All work shown on the Contract Drawings and included in the Technical Specifications including but not limited to:

- A. Installation & maintenance of all erosion and sedimentation control measures.
- B. Maintenance and protection of traffic.
- C. All clearing, grubbing, demolition, and disposal.
- D. Construction stake-out and layout.
- E. Site excavation and backfill.
- F. Providing structural fills or exporting material as needed for site work shown on the Contract Drawings.

- G. Sidewalks and pavements.
- H. Storm Drainage.
- I. Well and septic system
- J. All underground utilities
- K. Fencing & Gates.

LUMP SUM PRICE: \_\_\_\_\_

LUMP SUM PRICE IN WORDS: \_\_\_\_\_

3. **Provisional Item – Rock Excavation & Disposal:**

All costs associated with removal & disposal of ledge rock and boulders in excess of 2 C.Y.. and subsequent gravel refill.

|  | <u>QUANTITY</u> | <u>UNIT</u> | <u>UNIT PRICE</u> | <u>AMOUNT</u> |
|--|-----------------|-------------|-------------------|---------------|
| Rock Excavation & Disposal/Gravel Refill<br>(Ledge & Boulders in excess of 2 C.Y.) | 20              | C.Y.        | _____             | _____         |

UNIT PRICE IN WORDS: \_\_\_\_\_

4. **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.

|                           | <u>QUANTITY</u> | <u>UNIT</u> | <u>UNIT PRICE</u> | <u>AMOUNT</u> |
|---------------------------|-----------------|-------------|-------------------|---------------|
| Structural Fill Placement | 100             | C.Y.        | _____             | _____         |

UNIT PRICE IN WORDS: \_\_\_\_\_

5. **Provisional Item – Well in Excess of 300 VF:**

All costs associated with drilling and installing the proposed well to a depth in excess of 300 vertical feet (VF)

|                          | <u>QUANTITY</u> | <u>UNIT</u> | <u>UNIT PRICE</u> | <u>AMOUNT</u> |
|--------------------------|-----------------|-------------|-------------------|---------------|
| Well in Excess of 300 VF | 100             | V.F.        | _____             | _____         |

UNIT PRICE IN WORDS: \_\_\_\_\_

**6. Provisional Item – Well Casing in Excess of 40 VF:**

All costs associated with providing and installing additional well casing in excess of 40 feet deep.

|                                | <u>QUANTITY</u> | <u>UNIT</u> | <u>UNIT PRICE</u> | <u>AMOUNT</u> |
|--------------------------------|-----------------|-------------|-------------------|---------------|
| Well casing in excess of 40 VF | 40              | V.F.        | _____             | _____         |

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. Roofed Storage:**

The furnishing and installation of the proposed roofed storage area as shown on the contract drawings. This work shall include the roofed structure and foundation supports. The ground surface treatment shall be included in the base bid items.

LUMP SUM PRICE: \_\_\_\_\_

LUMP SUM PRICE IN WORDS: \_\_\_\_\_

**2. Fuel Station Canopy:**

The furnishing and installation of the proposed roofed storage area as shown on the contract drawings. This work shall include the roofed structure and foundation supports. The ground surface treatment shall be included in the base bid items.

LUMP SUM PRICE: \_\_\_\_\_

LUMP SUM PRICE IN WORDS: \_\_\_\_\_

**3. Additional 6' High Chain Link Fencing:**

The furnishing and installation of the proposed roofed storage area as shown on the contract drawings. This work shall include the roofed structure and foundation supports. The ground surface treatment shall be included in the base bid items.

|                                       | <u>QUANTITY</u> | <u>UNIT</u> | <u>UNIT PRICE</u> | <u>AMOUNT</u> |
|---------------------------------------|-----------------|-------------|-------------------|---------------|
| 6' High Galvanized Chain Link Fencing | 400             | L.F.        | _____             | _____         |

UNIT PRICE IN WORDS: \_\_\_\_\_

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

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.

**This contract is to be awarded as outlined in Article 19 of the Instructions to Bidders.** This contract is to be awarded to that responsible Bidder whose total bid is the lowest number of dollars for the above items. 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.

**ARTICLE 6 – TIME OF COMPLETION**

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

## **ARTICLE 7 – ATTACHMENTS TO THIS BID**

7.01 The following documents are submitted with and made a condition of this Bid:

- A. Required Bid security in the form of a Bid Bond (EJCDC No. C-430), bank money order or Certified Check (circle type of security provided);
- B. List of Proposed Subcontractors;
- C. List of Proposed Suppliers;
- D. List of Project References;
- E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;
- F. Contractor's License No.: \_\_\_\_\_ [or] Evidence of Bidder's ability to obtain a State Contractor's License and a covenant by Bidder to obtain said license within the time for acceptance of Bids and;
- G. Required Bidder Qualification Statement with Supporting Data
- H. A Form W-9

## **ARTICLE 8 – DEFINED TERMS**

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

## ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted by:

If Bidder is:

### **An Individual**

Name (typed or printed): \_\_\_\_\_

By: \_\_\_\_\_  
(Individual's signature)

Doing business as: \_\_\_\_\_

### **A Partnership**

Partnership Name: \_\_\_\_\_

By: \_\_\_\_\_  
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): \_\_\_\_\_

### **A Corporation**

Corporation Name: \_\_\_\_\_

State of Incorporation: \_\_\_\_\_

Type (General Business, Professional, Service, Limited Liability): \_\_\_\_\_

By: \_\_\_\_\_  
(Signature -- attach evidence of authority to sign)

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_

(CORPORATE SEAL)

Attest \_\_\_\_\_

Date of Qualification to do business in Connecticut is \_\_\_\_/\_\_\_\_/\_\_\_\_.

**A Joint Venture**

Name of Joint Venture: \_\_\_\_\_

First Joint Venturer Name: \_\_\_\_\_ (SEAL)

By: \_\_\_\_\_  
(Signature of first joint venture partner - attach evidence of authority to sign)

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_

Second Joint Venturer Name: \_\_\_\_\_ (SEAL)

By: \_\_\_\_\_  
(Signature of second joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_

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

9.02 Bidder's Business Address \_\_\_\_\_

\_\_\_\_\_

Phone No. \_\_\_\_\_ Fax No. \_\_\_\_\_

E-mail \_\_\_\_\_

SUBMITTED on \_\_\_\_\_, 20\_\_\_\_.

## BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

---

BIDDER (*Name and Address*):

SURETY (*Name and Address of Principal Place of Business*):

OWNER:

**Town of Voluntown  
115 Main Street  
Voluntown, CT 06384**

BID

Bid Due Date:

Description:

**Town of Voluntown Public Works Garage**

BOND

Bond Number:

Date (*Not earlier than Bid due date*):

Penal sum

\_\_\_\_\_  
(Words)

\$

\_\_\_\_\_  
(Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

**BIDDER**

**SURETY**

\_\_\_\_\_  
Bidder's Name and Corporate Seal

(Seal)

\_\_\_\_\_  
Surety's Name and Corporate Seal

(Seal)

By:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

Attest:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

By:

\_\_\_\_\_  
Signature (Attach Power of Attorney)

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

Attest:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title



*Note: Above addresses are to be used for giving any required notice. Provide execution by any additional parties, such as joint venturers, if necessary.*

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
  - 3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
  - 3.2 All Bids are rejected by Owner, or
  - 3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

# **CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY**

PROJECT NUMBER: \_\_\_\_ - \_\_\_\_

## **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:

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Address:

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Internal Revenue Service Employer Identification Number:

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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 from 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:

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**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?



- 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 \_\_\_\_\_ )  
 ) ss.  
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 \_\_\_\_.

**COMMISSION ON HUMAN RIGHTS AND OPPORTUNITIES**  
**CONTRACT COMPLIANCE REGULATIONS**  
**NOTIFICATION TO BIDDERS**

(Revised 09/3/15)

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-81i(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.

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**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 fifteen 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.

**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 offbearers; 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.

|   |   |
|---|---|
| <p><u>White</u> (not of Hispanic Origin)- All persons having origins in any of the original peoples of Europe, North Africa, or the Middle East.</p> <p><u>Black</u>(not of Hispanic Origin)- All persons having origins in any of the Black racial groups of Africa.</p> <p><u>Hispanic</u>- All persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.</p> | <p><u>Asian or Pacific Islander</u>- 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.</p> <p><u>American Indian or Alaskan Native</u>- All persons having origins in any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.</p> |
|---|---|

## BIDDER CONTRACT COMPLIANCE MONITORING REPORT

### PART I - Bidder Information

|   |   |
|---|---|
| Company Name<br>Street Address<br>City & State<br>Chief Executive | Bidder Federal Employer<br>Identification Number _____<br>Or<br>Social Security Number _____  |
| Major Business Activity<br>(brief description)                    | Bidder Identification<br>(response optional/definitions on page 1)<br><br>-Bidder is a small contractor. Yes ___ No ___<br>-Bidder is a minority business enterprise Yes ___ No ___<br>(If yes, check ownership category)<br>Black ___ Hispanic ___ Asian American ___ American Indian/Alaskan<br>Native ___ Iberian Peninsula ___ Individual(s) with a Physical Disability ___<br>Female ___ |
| Bidder Parent Company<br>(If any)                                 | - Bidder is certified as above by State of CT Yes ___ No ___  |
| Other Locations in Ct.<br>(If any)                                |   |

### 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?<br><div style="text-align: right;">Yes___ No___</div>   | 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.?<br><div style="text-align: right;">Yes___ No___</div>   |
| 2. Does your company have the state-mandated sexual harassment prevention in the workplace policy posted on company bulletin boards?<br><div style="text-align: right;">Yes___ No___</div>   | 8. Do you, upon request, provide reasonable accommodation to employees, or applicants for employment, who have physical or mental disability?<br><div style="text-align: right;">Yes___ No___</div>  |
| 3. Do you notify all recruitment sources in writing of your company's Affirmative Action/Equal Employment Opportunity employment policy?<br><div style="text-align: right;">Yes___ No___</div>   | 9. Does your company have a mandatory retirement age for all employees?<br><div style="text-align: right;">Yes___ No___</div>  |
| 4. Do your company advertisements contain a written statement that you are an Affirmative Action/Equal Opportunity Employer?<br><div style="text-align: right;">Yes ___ No ___</div>   | 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?<br><div style="text-align: right;">Yes ___ No ___ NA ___</div>  |
| 5. Do you notify the Ct. State Employment Service of all employment openings with your company?<br><div style="text-align: right;">Yes ___ No ___</div>  | 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?<br><div style="text-align: right;">Yes ___ No ___ NA ___</div> |
| 6. Does your company have a collective bargaining agreement with workers?<br><div style="text-align: right;">Yes___ No___</div> <div>             6a. If yes, do the collective bargaining agreements contain non-discrimination clauses covering all workers?<br/> <div style="text-align: right;">Yes___ No___</div> </div> <div>             6b. Have you notified each union in writing of your commitments under the nondiscrimination requirements of contracts with the state of Ct?<br/> <div style="text-align: right;">Yes___ No___</div> </div> | 12. Does your company have a written affirmative action Plan? Yes ___ No ___<br>If no, please explain.   |
|  | 13. Is there a person in your company who is responsible for equal employment opportunity?<br><div style="text-align: right;">Yes ___ No ___</div> If yes, give name and phone number.<br>_____  |

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 suppliers other than those identified in 1a. above? Yes\_\_ No\_\_

PART IV - Bidder Employment Information Date:

| JOB<br>CATEGORY *   | OVERALL<br>TOTALS | WHITE<br>(not of Hispanic<br>origin) |        | BLACK<br>(not of Hispanic<br>origin) |        | HISPANIC |        | ASIAN or PACIFIC<br>ISLANDER |        | AMERICAN INDIAN or<br>ALASKAN NATIVE |        |
|---|-------------------|--------------------------------------|--------|--------------------------------------|--------|----------|--------|------------------------------|--------|--------------------------------------|--------|
|   |                   | Male                                 | Female | Male                                 | Female | Male     | Female | Male                         | Female | male                                 | female |
| Management  |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Business & Financial Ops  |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Marketing & Sales   |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Legal Occupations   |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Computer Specialists  |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Architecture/Engineering  |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Office & Admin Support  |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Bldg/ Grounds<br>Cleaning/Maintenance   |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Construction & Extraction   |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Installation , Maintenance<br>& Repair  |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Material Moving Workers   |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Production Occupations  |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| TOTALS ABOVE  |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Total One Year Ago  |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| FORMAL ON THE JOB TRAINEES (ENTER FIGURES FOR THE SAME CATEGORIES AS ARE SHOWN ABOVE) |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Apprentices   |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |
| Trainees  |                   |                                      |        |                                      |        |          |        |                              |        |                                      |        |

\*NOTE: JOB CATEGORIES CAN BE CHANGED OR ADDED TO (EX. SALES CAN BE ADDED OR REPLACE A CATEGORY NOT USED IN YOUR COMPANY)



|  |     |    |                                    |   |                                   |  |
|--|-----|----|------------------------------------|---|-----------------------------------|--|
| 1. Which of the following recruitment sources are used by you?<br>(Check yes or no, and report percent used) |     |    |                                    | 2. Check (X) any of the below listed requirements that you use as a hiring qualification<br><br>(X) |                                   | 3. Describe below any other practices or actions that you take which show that you hire, train, and promote employees without discrimination |
| SOURCE   | YES | NO | % of applicants provided by source |   |                                   |  |
| State Employment Service   |     |    |                                    |   | Work Experience                   |  |
| Private Employment Agencies  |     |    |                                    |   | Ability to Speak or Write English |  |
| Schools and Colleges   |     |    |                                    |   | Written Tests                     |  |
| Newspaper Advertisement  |     |    |                                    |   | High School Diploma               |  |
| Walk Ins   |     |    |                                    |   | College Degree                    |  |
| Present Employees  |     |    |                                    |   | Union Membership                  |  |
| Labor Organizations  |     |    |                                    |   | Personal Recommendation           |  |
| Minority/Community Organizations   |     |    |                                    |   | Height or Weight                  |  |
| Others (please identify)   |     |    |                                    |   | Car Ownership                     |  |
|  |     |    |                                    |   | Arrest Record                     |  |
|  |     |    |                                    |   | Wage Garnishments                 |  |

Certification (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<br>OF MBE SUBCONTRACTOR(S)<br>OR SUPPLIER(S) OF MATERIALS | Check here if MBE(s)<br>qualify under Section<br>4-114a of the C.G.S. | Check here if MBE is<br>unregistered but wants to be<br>considered for good<br>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:

A.D., 20\_\_\_\_\_

County of \_\_\_\_\_ )

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

Project No(s).: \_\_\_\_\_

**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, been 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

**Job Name:** \_\_\_\_\_

**State Of:** \_\_\_\_\_

**County Of:** \_\_\_\_\_

**Location:** \_\_\_\_\_

### 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 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: \_\_\_\_\_



## **AGREEMENT AND BOND FORMS**

# Notice of Award

Date: \_\_\_\_\_

Project: **Town Of Voluntown Public Works Garage**

Owner: **Town of Voluntown, Connecticut**

Owner's Contract No.:

Contract:

Engineer's Project No.: **CLA-5598**

Bidder:

Bidder's Address:

You are notified that your Bid dated \_\_\_\_\_ for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for \_\_\_\_\_

The Contract Price of your Contract is \_\_\_\_\_ Dollars (\$\_\_\_\_\_).

5 copies of the proposed Contract Documents (except Drawings) accompany this Notice of Award.

5 sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within 15 days of the date you receive this Notice of Award.

1. Deliver to the Owner [\_\_\_\_\_] fully executed counterparts of the Contract Documents.
2. Deliver with the executed Contract Documents the Contract security [Bonds] as specified in the Instructions to Bidders (Article 20), General Conditions (Paragraph 5.01), and Supplementary Conditions (Paragraph SC-5.01).
3. Other conditions precedent:  
\_\_\_\_\_

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Contract Documents.

\_\_\_\_\_  
Town of Voluntown

Owner

By: \_\_\_\_\_

Authorized Signature

\_\_\_\_\_  
Title

Copy to Engineer

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1420 King Street, Alexandria, VA 22314-2794  
(703) 684-2882  
[www.nspe.org](http://www.nspe.org)

American Council of Engineering Companies  
1015 15th Street N.W., Washington, DC 20005  
(202) 347-7474  
[www.acec.org](http://www.acec.org)

American Society of Civil Engineers  
1801 Alexander Bell Drive, Reston, VA 20191-4400  
(800) 548-2723  
[www.asce.org](http://www.asce.org)

Associated General Contractors of America  
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308  
(703) 548-3118  
[www.agc.org](http://www.agc.org)

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# AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between Town of Voluntown, Connecticut (“Owner”) and  
\_\_\_\_\_ (“Contractor”).

Owner and Contractor hereby agree as follows:

## ARTICLE 1 – WORK

- 1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: **The installation of a new public works garage and associated site work as shown in the Contract Documents.**

## ARTICLE 2 – THE PROJECT

- 2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows: **Town of Voluntown Public Works Garage.**

## ARTICLE 3 – ENGINEER

- 3.01 The Project has been designed by CLA Engineers, Inc. (Engineer), which is to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

## ARTICLE 4 – CONTRACT TIMES

### 4.01 *Time of the Essence*

- A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

### 4.02 *Days to Achieve Substantial Completion and Final Payment*

- A. The Work will be substantially completed within **250** days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within **250** days after the date when the Contract Times commence to run.
- B. The Owner may suspend the contract time if weather conditions warrant.

#### 4.03 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of 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 **\$500.00** for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner **\$250.00** for each day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.

### ARTICLE 5 – CONTRACT PRICE

- 5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs 5.01.A, 5.01.B, and 5.01.C below:

- A. For all Work other than Unit Price Work, a lump sum of: \$\_\_\_\_\_

All specific cash allowances are included in the above price in accordance with Paragraph 11.02 of the General Conditions.

- B. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the actual quantity of that item:

#### UNIT PRICE WORK

|  | <u>Sec.</u> | <u>Description</u> | <u>Est<br/>Qty</u> | <u>Unit</u> | <u>Unit<br/>Price</u> | <u>Amount</u> |
|--|-------------|--------------------|--------------------|-------------|-----------------------|---------------|
|--|-------------|--------------------|--------------------|-------------|-----------------------|---------------|

Total of Bid Unit Prices (Unit Price Work): \$\_\_\_\_\_

The Bid prices for Unit Price Work set forth as of the Effective Date of the Agreement are based on estimated quantities. As provided in Paragraph 11.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer as provided in Paragraph 9.07 of the General Conditions.

## ARTICLE 6 – PAYMENT PROCEDURES

### 6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

### 6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the Last day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.
  - 1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions.
    - a. 95 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and
    - b. 0 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 98 percent of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 14.02.B.5 of the General Conditions and less 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

### 6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price (with the exception of 2 percent that shall be held by the Owner for a 6 month period) as recommended by Engineer as provided in said Paragraph 14.07. The 2 percent retainage shall be released by the Owner after 6 months if final work has remained in acceptable condition.

## **ARTICLE 7 – INTEREST**

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of 0 percent per annum.

## **ARTICLE 8 – CONTRACTOR’S REPRESENTATIONS**

8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

- A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
- B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Not Applicable
- E. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor’s safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 8.01.E above, Contractor does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

## ARTICLE 9 – CONTRACT DOCUMENTS

### 9.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement
2. Performance bond
3. Payment bond
4. Other bonds – Not Applicable
5. General Conditions
6. Supplementary Conditions
7. Specifications as listed in the table of contents of the Project Manual.
8. Drawings consisting of \_\_\_\_\_ sheets with each sheet bearing the following general title: \_\_\_\_\_ [or] the Drawings listed on attached sheet index.
9. Addenda (numbers \_\_\_\_\_ to \_\_\_\_\_, inclusive).
10. Exhibits to this Agreement (enumerated as follows):
  - a. Contractor's Bid
  - b. Documentation submitted by Contractor prior to Notice of Award.
11. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
  - a. Notice to Proceed.
  - b. Work Change Directives.
  - c. Change Orders.

B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.



## ARTICLE 10 – MISCELLANEOUS

### 10.01 *Terms*

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

### 10.02 *Assignment of Contract*

- A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

### 10.03 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

### 10.04 *Severability*

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

### 10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
  - 1. “corrupt practice” means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
  - 2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

This Agreement will be effective on \_\_\_\_\_ (which is the Effective Date of the Agreement).

OWNER:

Town of Voluntown, Connecticut

By: \_\_\_\_\_

Title: First Selectman

Attest: \_\_\_\_\_

Title: \_\_\_\_\_

Address for giving notices:

Town of Voluntown

115 Main Street

Voluntown, Connecticut 06384

(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

CONTRACTOR

By: \_\_\_\_\_

Title: \_\_\_\_\_

(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: \_\_\_\_\_

Title: \_\_\_\_\_

Address for giving notices:

License No.: \_\_\_\_\_

(Where applicable)

Agent for service of process:

\_\_\_\_\_

## PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

---

CONTRACTOR (*Name and Address*):                      SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

**Town of Voluntown**

**115 Main Street**

**Voluntown, Connecticut 06384**

CONTRACT

Effective Date of Agreement:

Amount:

Description (*Name and Location*):      **Town of Voluntown Public Works Garage**

BOND

Bond Number:

Date (*Not earlier than Effective Date of Agreement*):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

**CONTRACTOR AS PRINCIPAL**

**SURETY**

\_\_\_\_\_  
Contractor's Name and Corporate Seal                      (Seal)

\_\_\_\_\_  
Surety's Name and Corporate Seal                      (Seal)

By: \_\_\_\_\_  
Signature

By: \_\_\_\_\_  
Signature (Attach Power of Attorney)

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

Attest: \_\_\_\_\_  
Signature

Attest: \_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

*Note: Provide execution by additional parties, such as joint venturers, if necessary.*

Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

1. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 2.1.
2. If there is no Owner Default, Surety's obligation under this Bond shall arise after:
  - 2.1 Owner has notified Contractor and Surety, at the addresses described in Paragraph 9 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor, and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and
  - 2.2 Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 2.1; and
  - 2.3 Owner has agreed to pay the Balance of the Contract Price to:
    1. Surety in accordance with the terms of the Contract; or
    2. Another contractor selected pursuant to Paragraph 3.3 to perform the Contract.
3. When Owner has satisfied the conditions of Paragraph 2, Surety shall promptly, and at Surety's expense, take one of the following actions:
  - 3.1 Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or
  - 3.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
  - 3.3 Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 5 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or
  - 3.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
    1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
    2. Deny liability in whole or in part and notify Owner citing reasons therefor.
4. If Surety does not proceed as provided in Paragraph 3 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 3.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.
5. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 3.1, 3.2, or 3.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To the limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

- 5.1 The responsibilities of Contractor for correction of defective Work and completion of the Contract;
- 5.2 Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions of or failure to act of Surety under Paragraph 3; and
- 5.3 Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

6. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.

7. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.

8. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located, and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

9. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

10. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

#### 11. Definitions.

- 11.1 Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.
- 11.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
- 11.3 Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
- 11.4 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – *(Name, Address and Telephone)*

Surety Agency or Broker:

Owner's Representative *(Engineer or other party)*:

# PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

**Town of Voluntown  
115 Main Street  
Voluntown, Connecticut 06384**

CONTRACT

Effective Date of Agreement:

Amount:

Description (*Name and Location*): **Town of Voluntown Public Works Garage**

BOND

Bond Number:

Date (*Not earlier than Effective Date of Agreement*):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

**CONTRACTOR AS PRINCIPAL**

**SURETY**

\_\_\_\_\_  
Contractor's Name and Corporate Seal (Seal)

\_\_\_\_\_  
Surety's Name and Corporate Seal (Seal)

By: \_\_\_\_\_  
Signature

By: \_\_\_\_\_  
Signature (Attach Power of Attorney)

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

Attest: \_\_\_\_\_  
Signature

Attest: \_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

*Note: Provide execution by additional parties, such as joint venturers, if necessary.*

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to Owner, this obligation shall be null and void if Contractor:
  - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and
  - 2.2 Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.
4. Surety shall have no obligation to Claimants under this Bond until:
  - 4.1 Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
  - 4.2 Claimants who do not have a direct contract with Contractor:
    1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
    2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
    3. Not having been paid within the above 30 days, have sent a written notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.
5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.
6. Reserved.
7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.
8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.
9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.



10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders, and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

#### 15. Definitions

15.1 Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

15.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

15.3 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract, or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – *(Name, Address, and Telephone)*

Surety Agency or Broker:

Owner's Representative *(Engineer or other)*:

# Notice to Proceed

Date: \_\_\_\_\_

Project: **Town of Voluntown Public Works Garage**

Owner: **Town of Voluntown, Connecticut**

Owner's Contract No.:

Contract:

Engineer's Project No.: **CLA-5598**

Contractor:

Contractor's Address: *[send Certified Mail, Return Receipt Requested]*

You are notified that the Contract Times under the above Contract will commence to run on \_\_\_\_\_. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the number of days to achieve Substantial Completion is \_\_\_\_, and the number of days to achieve readiness for final payment is '\_\_\_\_\_'.  
\_\_\_\_\_

Before you may start any Work at the Site, Paragraph 2.01.B of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds and loss payees) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Also, before you may start any Work at the Site, you must:

\_\_\_\_\_ *[add other requirements]*.

Owner

Given by:

Authorized Signature

Title

Date

Copy to Engineer

## Contractor's Application for Payment No.

|                       |                           |                         |
|-----------------------|---------------------------|-------------------------|
|                       | Application Period:       | Application Date:       |
| To (Owner):           | From (Contractor):        | Via (Engineer):         |
| Project:              | Contract:                 |                         |
| Owner's Contract No.: | Contractor's Project No.: | Engineer's Project No.: |

### Application For Payment Change Order Summary

| Approved Change Orders |           |            | 1. ORIGINAL CONTRACT PRICE.....                                | \$ _____ |
|------------------------|-----------|------------|--|----------|
| Number                 | Additions | Deductions | 2. Net change by Change Orders.....                            | \$ _____ |
|                        |           |            | 3. Current Contract Price (Line 1 ± 2).....                    | \$ _____ |
|                        |           |            | 4. TOTAL COMPLETED AND STORED TO DATE                          |          |
|                        |           |            | (Column F on Progress Estimate).....                           | \$ _____ |
|                        |           |            | 5. RETAINAGE:  |          |
|                        |           |            | a.     X                      Work Completed.....              | \$ _____ |
|                        |           |            | b.     X                      Stored Material.....             | \$ _____ |
|                        |           |            | c. Total Retainage (Line 5a + Line 5b).....                    | \$ _____ |
|                        |           |            | 6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5c).....             | \$ _____ |
|                        |           |            | 7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)..... | \$ _____ |
|                        |           |            | 8. AMOUNT DUE THIS APPLICATION.....                            | \$ _____ |
|                        |           |            | 9. BALANCE TO FINISH, PLUS RETAINAGE                           |          |
|                        |           |            | (Column G on Progress Estimate + Line 5 above).....            | \$ _____ |
| TOTALS                 |           |            |  |          |
| NET CHANGE BY          |           |            |  |          |
| CHANGE ORDERS          |           |            |  |          |

|   |       |
|---|-------|
| <b>Contractor's Certification</b><br><br>The undersigned Contractor certifies that to the best of its knowledge: (1) all previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective. |       |
| By:   | Date: |

|                    |                                |  |
|--------------------|--------------------------------|--|
| Payment of:        | \$ _____                       | (Line 8 or other - attach explanation of the other amount) |
| is recommended by: | _____                          | _____  |
|                    | (Engineer)                     | (Date)   |
| Payment of:        | \$ _____                       | (Line 8 or other - attach explanation of the other amount) |
| is approved by:    | _____                          | _____  |
|                    | (Owner)                        | (Date)   |
| Approved by:       | _____                          | _____  |
|                    | Funding Agency (if applicable) | (Date)   |

Endorsed by the Construction Specifications Institute.

**Change Order**

No. \_\_\_\_\_

Date of Issuance: \_\_\_\_\_ Effective Date: \_\_\_\_\_

|             |   |                       |
|-------------|---|-----------------------|
| Project:    | Owner: Town of Voluntown                | Owner's Contract No.: |
| Contract:   | Date of Contract:                       |                       |
| Contractor: | Engineer's Project No.: <b>CLA-5598</b> |                       |

**The Contract Documents are modified as follows upon execution of this Change Order:**

Description:

**Attachments (list documents supporting change):****CHANGE IN CONTRACT PRICE:**

Original Contract Price:

\$ \_\_\_\_\_

[Increase] [Decrease] from previously  
approved Change Orders No. \_\_\_\_\_ to No. \_\_\_\_\_

\$ \_\_\_\_\_

Contract Price prior to this Change Order:

\$ \_\_\_\_\_

[Increase] [Decrease] of this Change Order:

\$ \_\_\_\_\_

Contract Price incorporating this Change

\$ \_\_\_\_\_

**CHANGE IN CONTRACT TIMES:**Original Contract Times: ☐ Working ☐ Calendar days

Substantial completion (days or date): \_\_\_\_\_

Ready for final payment (days or date): \_\_\_\_\_

[Increase] [Decrease] from previously approved Change Orders  
No. \_\_\_\_\_ to No. \_\_\_\_\_:

Substantial completion (days): \_\_\_\_\_

Ready for final payment (days): \_\_\_\_\_

Contract Times prior to this Change Order:

Substantial completion (days or date): \_\_\_\_\_

Ready for final payment (days or date): \_\_\_\_\_

[Increase] [Decrease] of this Change Order:

Substantial completion (days or date): \_\_\_\_\_

Ready for final payment (days or date): \_\_\_\_\_

Contract Times with all approved Change Orders:

Substantial completion (days or date): \_\_\_\_\_

Ready for final payment (days or date): \_\_\_\_\_

**RECOMMENDED:**

By: \_\_\_\_\_

Engineer (Authorized Signature)

Date: \_\_\_\_\_

Approved by Funding Agency (if applicable):

\_\_\_\_\_

**ACCEPTED:**

By: \_\_\_\_\_

Owner (Authorized Signature)

Date: \_\_\_\_\_

**ACCEPTED:**

By: \_\_\_\_\_

Contractor (Authorized Signature)

Date: \_\_\_\_\_

Date: \_\_\_\_\_

Certificate of Substantial Completion

|           |   |
|-----------|---|
| Project:  |   |
| Owner:    | Owner's Contract No.:                   |
| Contract: | Engineer's Project No.: <b>CLA-5598</b> |

This [tentative] [definitive] Certificate of Substantial Completion applies to:

☐ All Work under the Contract Documents:      ☐ The following specified portions of the Work:

|  |
|--|
|  |
|  |
|  |
|  |

\_\_\_\_\_  
Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

A [tentative] [definitive] list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

**The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:**

☐ Amended Responsibilities                      ☐ Not Amended

Owner's Amended Responsibilities:

|  |
|--|
|  |
|  |
|  |

Contractor's Amended Responsibilities:

|  |
|--|
|  |
|  |
|  |
|  |

The following documents are attached to and made part of this Certificate:

---

---

---

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

|                            |            |
|----------------------------|------------|
| <hr/> Executed by Engineer | <hr/> Date |
|----------------------------|------------|

|                              |            |
|------------------------------|------------|
| <hr/> Accepted by Contractor | <hr/> Date |
|------------------------------|------------|

|                         |            |
|-------------------------|------------|
| <hr/> Accepted by Owner | <hr/> Date |
|-------------------------|------------|

## **GENERAL CONDITIONS**

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# TABLE OF CONTENTS

|  | Page |
|--|------|
| Article 1 – Definitions and Terminology .....  | 1    |
| 1.01 Defined Terms.....  | 1    |
| 1.02 Terminology.....  | 5    |
| Article 2 – Preliminary Matters.....   | 6    |
| 2.01 Delivery of Bonds and Evidence of Insurance.....  | 6    |
| 2.02 Copies of Documents.....  | 6    |
| 2.03 Commencement of Contract Times; Notice to Proceed .....   | 6    |
| 2.04 Starting the Work.....  | 7    |
| 2.05 Before Starting Construction .....  | 7    |
| 2.06 Preconstruction Conference; Designation of Authorized Representatives .....   | 7    |
| 2.07 Initial Acceptance of Schedules .....   | 7    |
| Article 3 – Contract Documents: Intent, Amending, Reuse.....   | 8    |
| 3.01 Intent.....   | 8    |
| 3.02 Reference Standards .....   | 8    |
| 3.03 Reporting and Resolving Discrepancies .....   | 8    |
| 3.04 Amending and Supplementing Contract Documents .....   | 9    |
| 3.05 Reuse of Documents .....  | 10   |
| 3.06 Electronic Data.....  | 10   |
| Article 4 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental<br>Conditions; Reference Points ..... | 10   |
| 4.01 Availability of Lands .....   | 10   |
| 4.02 Subsurface and Physical Conditions .....  | 11   |
| 4.03 Differing Subsurface or Physical Conditions.....  | 11   |
| 4.04 Underground Facilities .....  | 13   |
| 4.05 Reference Points .....  | 14   |
| 4.06 Hazardous Environmental Condition at Site.....  | 14   |
| Article 5 – Bonds and Insurance .....  | 16   |
| 5.01 Performance, Payment, and Other Bonds .....   | 16   |
| 5.02 Licensed Sureties and Insurers .....  | 16   |
| 5.03 Certificates of Insurance .....   | 16   |
| 5.04 Contractor’s Insurance.....   | 17   |
| 5.05 Owner’s Liability Insurance .....   | 18   |
| 5.06 Property Insurance .....  | 18   |
| 5.07 Waiver of Rights .....  | 20   |
| 5.08 Receipt and Application of Insurance Proceeds .....   | 21   |
| 5.09 Acceptance of Bonds and Insurance; Option to Replace.....   | 21   |
| 5.10 Partial Utilization, Acknowledgment of Property Insurer .....   | 21   |
| Article 6 – Contractor’s Responsibilities .....  | 22   |
| 6.01 Supervision and Superintendence .....   | 22   |

|  |   |    |
|--|---|----|
| 6.02   | Labor; Working Hours.....                             | 22 |
| 6.03   | Services, Materials, and Equipment.....               | 22 |
| 6.04   | Progress Schedule.....                                | 23 |
| 6.05   | Substitutes and “Or-Equals”.....                      | 23 |
| 6.06   | Concerning Subcontractors, Suppliers, and Others..... | 25 |
| 6.07   | Patent Fees and Royalties.....                        | 26 |
| 6.08   | Permits.....  | 27 |
| 6.09   | Laws and Regulations.....                             | 27 |
| 6.10   | Taxes.....  | 28 |
| 6.11   | Use of Site and Other Areas.....                      | 28 |
| 6.12   | Record Documents.....                                 | 29 |
| 6.13   | Safety and Protection.....                            | 29 |
| 6.14   | Safety Representative.....                            | 30 |
| 6.15   | Hazard Communication Programs.....                    | 30 |
| 6.16   | Emergencies.....                                      | 30 |
| 6.17   | Shop Drawings and Samples.....                        | 30 |
| 6.18   | Continuing the Work.....                              | 32 |
| 6.19   | Contractor’s General Warranty and Guarantee.....      | 32 |
| 6.20   | Indemnification.....                                  | 33 |
| 6.21   | Delegation of Professional Design Services.....       | 34 |
| Article 7 – Other Work at the Site.....                |   | 34 |
| 7.01   | Related Work at Site.....                             | 34 |
| 7.02   | Coordination.....                                     | 35 |
| 7.03   | Legal Relationships.....                              | 35 |
| Article 8 – Owner’s Responsibilities.....              |   | 36 |
| 8.01   | Communications to Contractor.....                     | 36 |
| 8.02   | Replacement of Engineer.....                          | 36 |
| 8.03   | Furnish Data.....                                     | 36 |
| 8.04   | Pay When Due.....                                     | 36 |
| 8.05   | Lands and Easements; Reports and Tests.....           | 36 |
| 8.06   | Insurance.....  | 36 |
| 8.07   | Change Orders.....                                    | 36 |
| 8.08   | Inspections, Tests, and Approvals.....                | 36 |
| 8.09   | Limitations on Owner’s Responsibilities.....          | 36 |
| 8.10   | Undisclosed Hazardous Environmental Condition.....    | 37 |
| 8.11   | Evidence of Financial Arrangements.....               | 37 |
| 8.12   | Compliance with Safety Program.....                   | 37 |
| Article 9 – Engineer’s Status During Construction..... |   | 37 |
| 9.01   | Owner’s Representative.....                           | 37 |
| 9.02   | Visits to Site.....                                   | 37 |
| 9.03   | Project Representative.....                           | 38 |
| 9.04   | Authorized Variations in Work.....                    | 38 |
| 9.05   | Rejecting Defective Work.....                         | 38 |
| 9.06   | Shop Drawings, Change Orders and Payments.....        | 38 |
| 9.07   | Determinations for Unit Price Work.....               | 38 |

|              |   |    |
|--------------|---|----|
| 9.08         | Decisions on Requirements of Contract Documents and Acceptability of Work ..... | 39 |
| 9.09         | Limitations on Engineer's Authority and Responsibilities.....                   | 39 |
| 9.10         | Compliance with Safety Program.....   | 40 |
| Article 10 – | Changes in the Work; Claims .....   | 40 |
| 10.01        | Authorized Changes in the Work .....  | 40 |
| 10.02        | Unauthorized Changes in the Work .....  | 40 |
| 10.03        | Execution of Change Orders.....   | 40 |
| 10.04        | Notification to Surety.....   | 41 |
| 10.05        | Claims.....   | 41 |
| Article 11 – | Cost of the Work; Allowances; Unit Price Work.....                              | 42 |
| 11.01        | Cost of the Work .....  | 42 |
| 11.02        | Allowances .....  | 44 |
| 11.03        | Unit Price Work .....   | 45 |
| Article 12 – | Change of Contract Price; Change of Contract Times .....                        | 45 |
| 12.01        | Change of Contract Price.....   | 45 |
| 12.02        | Change of Contract Times .....  | 47 |
| 12.03        | Delays.....   | 47 |
| Article 13 – | Tests and Inspections; Correction, Removal or Acceptance of Defective Work..... | 48 |
| 13.01        | Notice of Defects .....   | 48 |
| 13.02        | Access to Work .....  | 48 |
| 13.03        | Tests and Inspections .....   | 48 |
| 13.04        | Uncovering Work.....  | 49 |
| 13.05        | Owner May Stop the Work.....  | 49 |
| 13.06        | Correction or Removal of Defective Work.....                                    | 49 |
| 13.07        | Correction Period .....   | 50 |
| 13.08        | Acceptance of Defective Work .....  | 51 |
| 13.09        | Owner May Correct Defective Work .....  | 51 |
| Article 14 – | Payments to Contractor and Completion.....                                      | 52 |
| 14.01        | Schedule of Values .....  | 52 |
| 14.02        | Progress Payments .....   | 52 |
| 14.03        | Contractor's Warranty of Title .....  | 54 |
| 14.04        | Substantial Completion.....   | 55 |
| 14.05        | Partial Utilization .....   | 55 |
| 14.06        | Final Inspection.....   | 56 |
| 14.07        | Final Payment .....   | 56 |
| 14.08        | Final Completion Delayed.....   | 57 |
| 14.09        | Waiver of Claims .....  | 58 |
| Article 15 – | Suspension of Work and Termination .....  | 58 |
| 15.01        | Owner May Suspend Work .....  | 58 |
| 15.02        | Owner May Terminate for Cause.....  | 58 |
| 15.03        | Owner May Terminate For Convenience.....  | 59 |
| 15.04        | Contractor May Stop Work or Terminate .....                                     | 60 |

|                                       |    |
|---------------------------------------|----|
| Article 16 – Dispute Resolution ..... | 60 |
| 16.01 Methods and Procedures .....    | 60 |
| Article 17 – Miscellaneous .....      | 61 |
| 17.01 Giving Notice .....             | 61 |
| 17.02 Computation of Times .....      | 61 |
| 17.03 Cumulative Remedies .....       | 61 |
| 17.04 Survival of Obligations .....   | 61 |
| 17.05 Controlling Law .....           | 61 |
| 17.06 Headings .....                  | 61 |

## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
  2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
  3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
  4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
  5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
  6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
  7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
  8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
  9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
  10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
  11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an



addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

## 1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

### B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

### C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

### D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
  - a. does not conform to the Contract Documents; or
  - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
  - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

### E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
  2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
  3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
  4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## **ARTICLE 2 – PRELIMINARY MATTERS**

### **2.01   *Delivery of Bonds and Evidence of Insurance***

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

### **2.02   *Copies of Documents***

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

### **2.03   *Commencement of Contract Times; Notice to Proceed***

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

## 2.04 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

## 2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
  - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
  - 2. a preliminary Schedule of Submittals; and
  - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

## 2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

## 2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
  - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of

the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

### **ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE**

#### **3.01    *Intent***

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

#### **3.02    *Reference Standards***

- A. Standards, Specifications, Codes, Laws, and Regulations
  1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
  2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

#### **3.03    *Reporting and Resolving Discrepancies***

##### **A.   *Reporting Discrepancies:***

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

**B. *Resolving Discrepancies:***

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
  - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
  - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

**3.04 *Amending and Supplementing Contract Documents***

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
  1. A Field Order;
  2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

### 3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
  1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
  2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

### 3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

## **ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS**

### 4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the

Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

#### 4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

- 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
- 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

- 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
- 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
- 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

#### 4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

- 1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
- 2. is of such a nature as to require a change in the Contract Documents; or
- 3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

- B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
  - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
  - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
  - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
  - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
  - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.



#### 4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
  - a. reviewing and checking all such information and data;
  - b. locating all Underground Facilities shown or indicated in the Contract Documents;
  - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
  - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

#### 4.05 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

#### 4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
  - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
  - 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
  - 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to

permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

## ARTICLE 5 – BONDS AND INSURANCE

### 5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

### 5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

### 5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

#### 5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
  - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
  - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
  - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
  - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
    - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
    - b. by any other person for any other reason;
  - 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
  - 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
  - 1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners,

employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
6. include completed operations coverage:
  - a. Such insurance shall remain in effect for two years after final payment.
  - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

#### 5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

#### 5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
  1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of

them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
  3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
  4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
  5. allow for partial utilization of the Work by Owner;
  6. include testing and startup; and
  7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

#### 5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:
1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
  2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.



#### 5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

#### 5.09 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

#### 5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

## ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

### 6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

### 6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

### 6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

#### 6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
  2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

#### 6.05 *Substitutes and “Or-Equals”*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or-equal” item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
1. “*Or-Equal*” Items: If in Engineer’s sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an “or-equal” item, in which case review and approval of the proposed item may, in Engineer’s sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
    - a. in the exercise of reasonable judgment Engineer determines that:
      - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
      - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
      - 3) it has a proven record of performance and availability of responsive service.
    - b. Contractor certifies that, if approved and incorporated into the Work:
      - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
      - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

## 2. *Substitute Items:*

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
- d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
  - 1) shall certify that the proposed substitute item will:
    - a) perform adequately the functions and achieve the results called for by the general design,
    - b) be similar in substance to that specified, and
    - c) be suited to the same use as that specified;
  - 2) will state:
    - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
    - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
    - c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
  - 3) will identify:
    - a) all variations of the proposed substitute item from that specified, and
    - b) available engineering, sales, maintenance, repair, and replacement services; and
  - 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

#### 6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or

entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
  - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
  - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

#### 6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its

use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### 6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

#### 6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner

and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

#### 6.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

#### 6.11 *Use of Site and Other Areas*

##### *A. Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.



## 6.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

## 6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
  - 1. all persons on the Site or who may be affected by the Work;
  - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts

any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

#### 6.14 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

#### 6.15 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

#### 6.16 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

#### 6.17 *Shop Drawings and Samples*

- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

##### 1. *Shop Drawings:*

- a. Submit number of copies specified in the General Requirements.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

##### 2. *Samples:*

- a. Submit number of Samples specified in the Specifications.

- b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

*C. Submittal Procedures:*

- 1. Before submitting each Shop Drawing or Sample, Contractor shall have:
  - a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
  - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
  - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
  - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
- 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
- 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

*D. Engineer's Review:*

- 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
- 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the

Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
  1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
  1. observations by Engineer;
  2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. use or occupancy of the Work or any part thereof by Owner;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.

#### 6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
  1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
  2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

## 6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

## **ARTICLE 7 – OTHER WORK AT THE SITE**

### 7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
  - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
  - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe

access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

#### 7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
  - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
  - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
  - 3. the extent of such authority and responsibilities will be provided.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

#### 7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

## ARTICLE 8 – OWNER’S RESPONSIBILITIES

### 8.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

### 8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

### 8.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

### 8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

### 8.05 *Lands and Easements; Reports and Tests*

- A. Owner’s duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner’s identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

### 8.06 *Insurance*

- A. Owner’s responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

### 8.07 *Change Orders*

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

### 8.08 *Inspections, Tests, and Approvals*

- A. Owner’s responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

### 8.09 *Limitations on Owner’s Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor’s means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws



and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

**ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION**

9.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

### 9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

### 9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

### 9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

### 9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

### 9.07 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations

on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of,

and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

#### 9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

### **ARTICLE 10 – CHANGES IN THE WORK; CLAIMS**

#### 10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

#### 10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

#### 10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
  - 1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
  - 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
  - 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of

executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

#### 10.04 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

#### 10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
  - 1. deny the Claim in whole or in part;
  - 2. approve the Claim; or
  - 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

## **ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

### **11.01 *Cost of the Work***

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:
  - 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
  - 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
  - 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
  - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
  - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
  - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
  - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
  - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
  - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
  - g. The cost of utilities, fuel, and sanitary facilities at the Site.
  - h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
  - i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
  2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
  3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
  4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
  5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

## 11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:*
1. Contractor agrees that:
    - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
    - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in



the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
  1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
  2. there is no corresponding adjustment with respect to any other item of Work; and
  3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

## **ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES**

12.01 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
  2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
  3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee*: The Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
  2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
    - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
    - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
    - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
    - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
    - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
    - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

## 12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

## 12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

## **ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK**

### **13.01 *Notice of Defects***

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

### **13.02 *Access to Work***

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

### **13.03 *Tests and Inspections***

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
  - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
  - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
  - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

#### 13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

#### 13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

#### 13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers,

architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

### 13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
  - 1. repair such defective land or areas; or
  - 2. correct such defective Work; or
  - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
  - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

### 13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

### 13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

## **ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION**

### **14.01 *Schedule of Values***

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

### **14.02 *Progress Payments***

#### **A. *Applications for Payments:***

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

#### **B. *Review of Applications:***

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's



review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
  - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
  - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
  - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
- a. to supervise, direct, or control the Work, or
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
  - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. the Contract Price has been reduced by Change Orders;
- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

*C. Payment Becomes Due:*

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

*D. Reduction in Payment:*

- 1. Owner may refuse to make payment of the full amount recommended by Engineer because:
  - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
  - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
  - c. there are other items entitling Owner to a set-off against the amount recommended; or
  - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
- 2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
- 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

**14.03 Contractor's Warranty of Title**

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

#### 14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

#### 14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

#### 14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 14.07 *Final Payment*

##### A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
  - b. consent of the surety, if any, to final payment;
  - c. a list of all Claims against Owner that Contractor believes are unsettled; and

- d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

*B. Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

*C. Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

*14.08 Final Completion Delayed*

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

## 14.09 *Waiver of Claims*

### A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

## **ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION**

### 15.01 *Owner May Suspend Work*

- #### A.
- At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

### 15.02 *Owner May Terminate for Cause*

#### A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
3. Contractor's repeated disregard of the authority of Engineer; or
4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

#### B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
  3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

#### 15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
  3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other

dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

#### 15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

### **ARTICLE 16 – DISPUTE RESOLUTION**

#### 16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or



2. agrees with the other party to submit the Claim to another dispute resolution process; or
3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

## **ARTICLE 17 – MISCELLANEOUS**

### **17.01 *Giving Notice***

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
  1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
  2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

### **17.02 *Computation of Times***

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

### **17.03 *Cumulative Remedies***

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

### **17.04 *Survival of Obligations***

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

### **17.05 *Controlling Law***

- A. This Contract is to be governed by the law of the state in which the Project is located.

### **17.06 *Headings***

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

## **SUPPLEMENTARY CONDITIONS**

## SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (No. C-700, 2007 Edition) and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions will have the meanings indicated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

### TABLE OF CONTENTS

|              |  | Page |
|--------------|--|------|
| SC-1.01.A.3  | Application for Payment                            | 1    |
| SC-1.01.A.9  | Change Order                                       | 1    |
| SC-2.03.A    | Commencement of Contract Times; Notice to Proceed  | 1    |
| SC-4.06      | Hazardous Environmental Condition at Site          | 1    |
| SC-5.01      | Performance, Payment, and Other Bonds              | 1    |
| SC-5.04      | Contractor's Liability Insurance                   | 2    |
| SC-6.05.C    | Substitutes and "Or-Equals", Engineer's Evaluation | 3    |
| SC-6.06      | Concerning Subcontractors, Suppliers, and Others   | 4    |
| SC-6.10      | Taxes  | 4    |
| SC-6.11.B    | Use of Site and Other Areas                        | 4    |
| SC-6.11.C    | Use of Site and Other Areas                        | 4    |
| SC-6.16      | Emergencies  | 5    |
| SC-14.02.A.3 | Retainage  | 5    |
| SC-14.02.A.4 | Applications for Payment                           | 5    |
| SC-17.05     | Controlling Law                                    | 6    |
| SC-18        | Street and Sidewalk Access                         | 6    |
| SC-19        | Temporary Power                                    | 7    |
| SC-20        | Blasting   | 7    |

**SC-1.01.A.3. Add the following language to the end of Paragraph 1.01.A.3:**

The Application for Payment form to be used on this Project is EJCDC No. C-620 or AIA Document G720. The Owner must approve all Applications for Payment before payment is made.

**SC-1.01.A.9. Add the following language to the end of Paragraph 1.01.A.9:**

The Change Order form to be used on this Project is EJCDC No. C-941. Owner's approval is required before Change Orders are effective.

**SC-2.03.A. Delete Paragraphs 2.03.A in its entirety and insert the following:**

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the One Hundred and Twentieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

**SC-4.06. Delete Paragraphs 4.06.A and 4.06.B in their entirety and insert the following:**

- A. No reports or drawings of Hazardous Environmental Conditions at or contiguous to the Site are known to the Owner or Engineer.
- B. Not used.

**SC-5.01. Add the following new paragraph immediately after Paragraph 5.01.C:**

- D. 100% Performance and Payment bonds are required of the successful bidder. This bond shall cover all aspects of the specification and shall be delivered to the Purchasing Agent prior to the issuance of a purchase order. Bonds must meet the following requirements: Corporation - must be signed by an official of the corporation above their official title and the corporate seal must be affixed over the signature; Firm or Partnership - must be signed by all the partners and indicate they are "doing business as"; Individual - must be signed by the owner and indicated as "Owner". The surety company executing the bond or countersigning must be licensed in Connecticut and an official of the surety company must sign the bond with the corporate seal affixed over their signature. Signatures of two witnesses for both the principal and the surety must appear on the bond. Power of attorney for the official signing the bond for the surety company must be submitted with the bond. The Performance and Payment Bonds will be returned upon completion and acceptance of the job.

**SC-5.04. Add the following new paragraph immediately after Paragraph 5.04.B:**

C. Contractor/Vendor will agree to maintain in force at all times during which work/services are to be performed, the following minimum limits of insurance coverage. The insurance company(ies) must be licensed with the State of Connecticut and have a Financial Strength Rating of "A-" or higher and a Financial Size Rating of VIII or higher from A.M. Best Company. The limits of liability for insurance required by Paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, Employers' Liability and related coverages under Paragraphs 5.04.A.1 and A.2 of the General Conditions:
  - a. State Statutory
  - b. Applicable Federal (e.g., Longshoremen's) Statutory
  - c. Employer's Liability \$1,000,000 Each Accident  
\$1,000,000 Disease, Policy Limit  
\$1,000,000 Disease, Each Employee
2. Contractor's General Liability under Paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverage and eliminate the exclusion with respect to property under the care, custody, and control of the Contractor:
  - a. General Aggregate \$ 2,000,000
  - b. Products - Completed Operations Aggregate \$ 2,000,000
  - c. Personal and Advertising Injury \$ 1,000,000
  - d. Each Occurrence (Bodily Injury and Property Damage) \$ 1,000,000
  - e. Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.
  - f. Excess or Umbrella Liability
    - 1) General Aggregate \$ 5,000,000
    - 2) Each Occurrence \$ 5,000,000
3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions:
  - a. Bodily Injury:  
Each Person \$ 1,000,000  
Each Accident \$ 1,000,000

- b. Property Damage:
    - Each Accident \$ 1,000,000
  - c. Combined Single Limit of \$ 1,000,000
4. The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:
- a. Bodily Injury:
    - Each Person \$ 2,000,000
    - Each Accident \$ 2,000,000
  - b. Property Damage:
    - Each Accident \$ 2,000,000
    - Annual Aggregate \$ 2,000,000
5. **The Engineer and the Town shall be listed as additional insured.**
6. Certificates of Insurance documenting the coverage listed above must be presented to The Town of Waterford prior to the commencing of any work/service. The Contractor/Vendor also agrees to provide replacement and/or renewal certificates at least 30 days prior to the expiration of each policy.
7. If any policy is written on a "Claims Made" basis, the policy must be continually renewed for a minimum of two (2) years following the completion date of the work/service. If the claims-made policy is replaced and/or the retroactive date is changed, then the expiring policy must be endorsed to extend the reporting period for claims for two (2) years from the completion date.
8. Contractors shall observe and comply with all Federal, State and local laws, ordinances and regulations. Contractors shall indemnify and save harmless the Town, all of its officers, agents and servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation or negligence whether by the bidder, his employees, his consultant and/or their employees.

**SC-6.05.C. Amend the paragraph by making two subparagraphs under the title C. Engineer's Evaluation. The paragraph text is retitled, 6.05.C.2 After Effective Date of Agreement. A new paragraph is added before this paragraph to read as follows:**

- 1. During Bidding. The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or "or-equal" materials and equipment as defined in paragraph 6.05 of the General Conditions, or those substitute materials and equipment approved by the Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function, and quality to be met by any proposed substitute or "or-equal" item. Request for Engineer's clarification of materials and equipment considered "or-equal" prior to the Effective Date of the Agreement must be received by the Engineer at least 5 days prior to the date for receipt of Bids. No item of material or equipment will be

considered by Engineer as a substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each request shall conform to the requirements of Paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon the Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any proposed substitute item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

**SC-6.06. Add a new paragraph immediately after Paragraph 6.06.G:**

- 6.06.H: The Contractor shall not award work valued at more than fifty (50%) percent of the Contract Price to Subcontractor(s), without prior written approval of the Owner.
- 6.06.I: The apparent low bidder (within 5 days of the bid opening) shall submit to the Owner a list of all proposed subcontractors. Subcontractors shall be submitted by the low bidder and evaluated by the Owner in accordance with article 12 of the Instructions to Bidders.

**SC-6.10. Add a new paragraph immediately after Paragraph 6.10.A:**

- B. Owner is exempt from payment of sales and compensating use taxes of the State of Connecticut and of cities and counties thereof on all materials to be incorporated into the Work.
1. Owner will furnish the required certificates of tax exemption to Contractor for use in the purchase of supplies and materials to be incorporated into the Work.
  2. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

**SC-6.11.B. Add the following language at the end of paragraph 6.11.B:**

The materials or refuse or other debris used in the construction of the work, shall be legally disposed away from the site in such manner so that will not endanger or interfere with persons or the work being performed.

**SC-6.11.C. Delete Paragraphs 6.11.C in its entirety and insert the following:**

*C. Cleaning:*

1. 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.
2. 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.
3. 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 disposed of off-site and the work left broom clean, to the satisfaction of the Owner.
4. Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

**SC-6.16. Add a new paragraph immediately after Paragraph 6.16.A:**

- B. 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.

**SC-14.02.A.3. Add the following language at the end of paragraph 14.02.A.3:**

No payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage, or invest the retainage for the benefit of the Contractor.

**SC-14.02.A.4. Add the following new Paragraph after Paragraph 14.02.A.4:**

The Application for Payment form to be used on this Project is EJCDC No. C-620 or AIA Document G720. The Owner must approve all Applications for Payment before payment is made.



**SC-17.05 Add a new paragraph immediately after Paragraph 17.05.A:**

- B. Contractors shall observe and comply with all Federal, State and local laws, ordinances and regulations. Contractors shall indemnify and save harmless the Town, all of its officers, agents and servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation or negligence whether by the bidder, his employees, his consultant and/or their employees.

**SC-18 Add a new Article 18, “STREET AND SIDEWALK ACCESS,” after Article 17.**

**18.01 *Streets and Sidewalks to be Kept Open***

- A. 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.
- B. 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.

**18.02 *Emergency Access***

- A. The Contractor shall provide all necessary emergency vehicle crossings at principal intersections or ways usually traveled by emergency apparatus with provisions for the apparatus so it can travel along the line of the pipe installations.
- B. 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, Board of Education, and ambulance company shall be notified by the Contractor, and their consent obtained before any such action is initiated.

**18.03 *Bus Line Interference***

- A. 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.

**SC-19 Add a new Article 19, “TEMPORARY POWER,” after Article 18.**

19.01 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.

**SC-20 Add a new Article 20, “BLASTING,” after Article 19.**

20.01 *Approvals*

- A. 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 Voluntown for instructions relative to the regulations for possession and use of explosives in the Town of Voluntown, 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.

20.02 *Requirements*

- A. 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 Voluntown, 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 Voluntown, 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.
- B. 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.
- C. 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.

# TECHNICAL SPECIFICATIONS

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

## **CIVIL SITE TECHNICAL SPECIFICATION**

### **SECTION**

|       |                                      |
|-------|--------------------------------------|
| 02000 | SITE GENERAL CONDITIONS              |
| 02100 | SITE PREPARATION                     |
| 02210 | SITE EARTHWORK                       |
| 02230 | UTILITIES EXCAVATION AND BACKFILLING |
| 02510 | PAVING, WALKS, AND CURBS             |
| 02530 | SANITARY SEWER SYSTEM                |
| 02660 | WATER DISTRIBUTION                   |
| 02720 | STORM AND GROUNDWATER DRAINAGE       |
| 02740 | MISCELLANEOUS SITE UTILITIES         |
| 02800 | SITE IMPROVEMENTS                    |
| 02830 | FENCING                              |
| 02900 | LAWNS                                |
| 02910 | PLANTINGS                            |

## **STRUCTURAL TECHNICAL SPECIFICATION**

### **SECTION**

|       |   |
|-------|---|
| 01410 | SPECIAL INSPECTION AND STRUCTURAL TESTING |
| 03300 | CAST-IN-PLACE REINFORCED CONCRETE         |
| 05310 | STEEL DECK                                |
| 05400 | COLD FORMED METAL FRAMING                 |
| 06100 | ROUGH CARPENTRY                           |

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**TABLE OF CONTENTS**

**Division 7 - Thermal and Moisture Protection**

|                                 |     |
|---------------------------------|-----|
| 07200 Insulation                | 1-5 |
| 07600 Flashing & Sheet Metal    | 1-4 |
| 07840 Firestopping              | 1-6 |
| 07915 Sealant, Caulking & Seals | 1-3 |

**Division 8 - Doors and Windows**

|                                |                       |
|--------------------------------|-----------------------|
| 08110 Steel Doors and Frames   | 1-5                   |
| 08200 Wood Doors               | 1-5                   |
| 08310 Access Doors             | 1-3                   |
| 08630 Overhead Sectional doors | 1-4                   |
| 08710 Finish Hardware          | Scheduled on Drawings |
| 08800 Glass and Glazing        | 1-9                   |

**Division 9 - Finishes**

|   |      |
|---|------|
| 09250 Gypsum Drywall                    | 1-8  |
| 09510 Acoustical Ceiling and Suspension | 1-5  |
| 09650 Resilient Flooring                | 1-6  |
| 09900 Painting                          | 1-10 |

**Division 10 – Specialties**

|                          |     |
|--------------------------|-----|
| 10522 Fire Extinguishers | 1-3 |
| 10800 Toilet Accessories | 1-4 |

**Division 13 - Special Construction**

|                                     |     |
|-------------------------------------|-----|
| 13122 Pre-Engineered Metal Building | 1-9 |
|-------------------------------------|-----|

**SPECIFICATIONS DIVISIONS 13, 15 & 16 - TABLE OF CONTENTS**

**DIVISION 15**

|       |   |
|-------|---|
| 15010 | Basic Mechanical Requirements           |
| 15050 | Basic Mechanical Materials and Methods  |
| 15100 | Valves                                  |
| 15140 | Supports and Anchors                    |
| 15190 | Mechanical Identification               |
| 15250 | Mechanical Insulation                   |
| 15282 | Gas Detection System                    |
| 15411 | Water Distribution Piping               |
| 15420 | Drainage and Vent Systems               |
| 15489 | Facility Liquefied Petroleum Gas Piping |
| 15700 | HVAC Split Systems                      |
| 15830 | Terminal Units                          |
| 15850 | Makeup Air Units                        |
| 15870 | Power Ventilators                       |
| 15891 | Metal Ductwork                          |
| 15910 | Ductwork Accessories                    |
| 15932 | Air Outlets and Inlets                  |
| 15990 | Testing, Adjusting and Balancing        |

**DIVISION 16**

|       |  |
|-------|--|
| 16010 | Basic Electrical Requirements          |
| 16050 | Basic Electrical Materials and Methods |
| 16110 | Raceways                               |
| 16120 | Wires and Cables                       |
| 16135 | Cabinets, Boxes and Fittings           |
| 16143 | Wiring Devices                         |
| 16170 | Circuit and Motor Disconnects          |
| 16190 | Supporting Devices                     |
| 16195 | Electrical Identification              |
| 16420 | Service Entrance                       |
| 16452 | Grounding                              |
| 16470 | Panelboards                            |
| 16475 | Overcurrent Protective Devices         |
| 16495 | Automatic Transfer Switches            |
| 16515 | Interior Lighting                      |
| 16621 | LP Gas Generators                      |
| 16721 | Fire Alarm System                      |

END OF TABLE OF CONTENTS

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

## 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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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.

All erosion and sedimentation control shall conform to "Connecticut Guidelines for Soil Erosion and Sediment Control;" by the Connecticut Council on Soil and Water Conservation, 2002.

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



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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 and anti-tracking pad/construction entrance.

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 02510: Paving, Walks and Curbs

Section 02530: Sanitary Sewer System

Section 02660: Water Distribution

Section 02720: Storm & Groundwater Drainage

Section 02740: Miscellaneous Site Utilities

Section 02800: Site Improvements

Section 02900: Lawns

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

Section 02910: Plantings

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.

Hay bales of standard size, hay or straw, having no loose or decomposed baling twine. Stakes shall be 2 inches x 3 feet-0 inches long, pointed on one end.

Filter Fabric: M.08.01-26 of Form 816.

PART 3 - EXECUTION

SILTATION CONTROL

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

Before construction begins, install anti-tracking pad/construction entrance where shown on the drawings. Place stone on filter fabric.

Conform to "Connecticut Guidelines for Soil Erosion and Sediment Control," by the Connecticut Council on Soil and Water Conservation, 2002.

Conform to details on the drawings for fabric sedimentation barrier: use stakes supplied by the fence manufacturer; follow installation instructions. Hay bales shall be held in place by minimum 2 stakes driven through each bale.

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

Remove and replace anti-tracking pad if contaminated.

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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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 extraneous matter or debris.

Ring stockpiles with hay bales.

END OF SECTION

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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 Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

Section 02510: Paving, Walks and Curbs

Section 02530: Sanitary Sewer System

Section 02660: Water Distribution

Section 02720: Storm & Groundwater Drainage

Section 02740: Miscellaneous Site Utilities

Section 02800: Site Improvements

Section 02900: Lawns

Section 02910: Plantings

**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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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.

"State Specifications": Shall mean "State of Connecticut D.O.T. Standard Specifications for Roads, Bridges and Incidental Construction", Form 816, 2004, including all supplements and revisions.

**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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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.



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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.

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

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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 of 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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

**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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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 disking 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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

**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 of curbs and pavement, and replacement of same with like materials.

Removal and replacement of ground cover plantings.

Removal, protection and replanting of shrubbery as necessary.

Protection of trees and replacement as necessary.

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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

#### 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.

Bituminous paving and concrete paving.

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.



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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 it 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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

**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 acceptable 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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

#### 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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

## SECTION 02510 - PAVING, WALKS AND CURBS

### PART 1 - GENERAL

#### RELATED DOCUMENTS

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

#### DESCRIPTION OF THE WORK

Paving, walks and curbs shall include, but is not necessarily limited to, the following:

2-course bituminous concrete pavements.

Painted parking lines, stop bars and symbols.

Concrete pavement, walks, slabs, pads, ramps and stoops.

#### RELATED WORK SPECIFIED ELSEWHERE

Section 02000: Site General Conditions

Section 02210: Site earthwork including processed aggregate bases for pavements and curbs, and walks.

Section 02800: Site Improvements

#### SPECIAL REQUIREMENTS

Meet and match existing bituminous concrete pavement on existing streets at the same finish grade.

Comply with Town of **Voluntown** regulations.

#### SUBMITTALS

Bituminous Concrete Paving: Material certificates signed by material producer and Contractor, certifying that material complies with specified requirements.

Paint: Manufacturer's printed specifications and instructions and recommendations for application.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

Concrete: Manufacturer's product date, test reports, and materials certifications for Cast-In-Place Concrete.

Compaction test results.

Concrete Curb: Suppliers product test reports, and required material certifications for concrete curb.

**PART 2 - PRODUCTS**

**GENERAL**

Bituminous Concrete Course: M.04.01, Class 1 & 2 of Form 816.

Line and Symbol Paint: Shall conform to Section 12.09.02 of DOT Form 816.

Concrete: 4,000 psi (28-day compressive strength). If not indicated use Class "C" concrete for surface work and Class "A" concrete for underground.

Welded Steel Wire Mesh: ASTM Specification A-185, "Specification for Welded Steel Wire Fabric for Concrete Reinforcement." Furnish in flat sheets, not rolls.

Premolded Joint Filler: Non-extruding and resilient bituminous type; ASTM D-1751.

**PART 3 - EXECUTION**

**GENERAL**

**Bituminous Concrete Pavement**

Install bituminous concrete pavement where and to thickness and courses as shown, on an approved processed aggregate base course provided under in Section 02210.

Conform to Section 4.06 of Form 816. Where tests are required by Architect, provide by an approved independent testing laboratory paid for by the Owner.

Compact to thickness indicated.

Sawcut and install bituminous concrete pavement over processed gravel base in repair areas as shown on the plans.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

Line and Symbol Paint

Comply with manufacturer's instructions and recommendations for application.

Apply on a clean finish pavement minimum 3 weeks after completion of work. Use zone marking equipment; lines shall be carefully laid out. Edges even the true. Stripes shall be 4 inches wide for parking lines and conforming to State of Connecticut, Department of Transportation for stop bars. Conform to State code and local regulations in handicapped parking areas.

Concrete Pavement. Walks, Pads, Slabs, Ramps and Stoops

Install where shown on an approved processed aggregate base course provided in Section 02210.

Conform to applicable provisions of Article 9.21.03 of Form 81 6

Compact base. Moist but no standing water. Do not place concrete on frozen base.

Do not place concrete when below freezing. When 40 degrees F within 24 hours after placing concrete, bring mix to minimum of 50 degrees F.

Clean forms. True to Line. Firmly staked in place. Strong enough to resist pressure of concrete without springing. Tight enough to prevent mortar leakage. Tops at exact finished grade. Steel or wood forms are acceptable.

Spade concrete thoroughly along forms and expansion joints. Vibrate, tamp, and screed to a dense mass. Lay with expansion joints coinciding with the pattern indicated on the drawings. Pour in alternate sections (400 square feet maximum) with expansion joints between pours.

Provide 3/8 inches wide expansion joints. Form with premolded joint filler. Cut back filler 1/4 inch below finish of pavement. Provide additional expansion joints around utility structures in concrete pavements and where concrete abuts other structures.

Score joints using scoring tool minimum 12 inches long. Cut between expansion joints to complete the pattern shown on the plans. Cut while concrete is workable.

Stiff broom finish walks, using new street broom. Bristle marks shall be perpendicular to direction of traffic unless otherwise noted. Finish after concrete is placed, screened, and steel troweled to a smooth even surface. Bring sufficient mortar to the surface for the finish



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

1/4 inches +/- in 10 feet in any direction tolerance.

Curing

Keep surfaces covered with burlap, polyethylene, or material approved by the Architect. Keep wet for a minimum of 72 hours, then completely remove covering.

If below 40 degrees F, maintain concrete at 50 degrees F for not less than 5 days after pouring.

Remove forms while concrete is "green". Protect from damage from construction operations. Replace and repair damaged work as directed by the Architect. No use for a minimum of 3 days after construction. Clean thoroughly all surfaces and keep clean until the completion of this Contract.

Handicap ramps to be installed as shown on the drawings and in conformance with Section 9.24 of Form 816.

END OF SECTION

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

**SECTION 02530 - SANITARY SEWER SYSTEM**

**PART 1 - GENERAL**

**RELATED DOCUMENTS**

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

**DESCRIPTION OF THE WORK**

Sanitary sewers shall include, but are not necessarily limited to the following:

Piping and structures for sanitary sewer services, force main and pump station from a point 5 feet outside the building.

**RELATED WORK SPECIFIED ELSEWHERE**

Section 02000: Site General Conditions

Section 02210: Site Earthwork

Section 02230: Utilities Excavation and Backfill

Section 02800: Site Improvements

**SUBMITTALS**

Shop drawings for PVC pipe and fittings and concrete structures. Shop drawings shall be submitted for approval for all material and equipment included in the pump station item.

As-Built Drawings: Record on a print, all deviations from contract requirements. Record final and actual sizes, locations and elevations of all components. At completion of work, transfer information to transparency to show “As-Built” conditions. Provide As-Built transparency to the owner before final acceptance.

- A. Shop drawings for PVC pipe and fittings and concrete structures.
- B. As-Built Drawings: Record on a print, all deviations from contract requirements. Record final and actual sizes, locations and elevations of all components. At completion of work, transfer information to transparency to show “As-Built” conditions. Provide As-Built transparency to the owner before final acceptance.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

**PART 2 - PRODUCTS**

**2.01 GENERAL**

- A. All septic system materials listed below must conform to the Connecticut Public Health Code – Regulations and Technical Standards For Subsurface Sewage Disposal Systems.
- B. POLYVINYL CHLORIDE (PVC) SEWER PIPE:  
4" PVC distribution pipe shall be unplasticized polyvinyl chloride plastic gravity sewer pipe integral wall bell and spigot joints. Pipe and fittings shall meet and/or exceed all of the requirements of A.S.T.M. Specifications D 3034, latest revision, SDR 35, Type PSM. Provisions must be made for contraction and expansion at each joint with a rubber ring. The bell shall consist of an integral wall section stiffened with two PVC retainer rings which securely lock the solid cross section rubber ring into position. All fittings and accessories shall be as manufactured and furnished by the pipe supplier and have bell and/or spigot configurations identical to that of the pipe.
- C. SEPTIC TANK: The septic tank shall be precast concrete approved for use by the local health department and as shown on the plans
- D. LEACHING CHAMBERS: Leaching chambers shall be 18"high x 4' wide x 8'long precast concrete with a design loading of AASHO HS20-44 as shown on the plans.
- E. DISTRIBUTION BOXES: D-boxes shall be precast concrete with a design loading of AASHO HS20-44 and shall have inlets and openings as delineated on the plans
- F. LEACHING SYSTEM FILL MATERIAL: A clean, granular sand and gravel fill is required in the area of leaching systems. The fill shall contain no more than 5% fines, and preferably no more than 2%. Fines are clay and silt sized particles which pass the #200 sieve. The fill material should not contain any material larger than three (3) inches. A sieve analysis should be performed on a representative sample of the fill. Up to 45% by weight of the fill sample may be retained on the #4 sieve. The material that passes the #4 sieve is then dried and reweighted and the sieve analysis started. The sieve analysis must demonstrate that the material meets each of the following specifications:

Sieve Size

% That must Pass Sieve

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

|                 |            |      |         |
|-----------------|------------|------|---------|
| Coarse Sands    | #4- - #10  | # 4  | 100%    |
| Medium Sands    | #10 - #40  | #10  | 0%-100% |
| Fine Sands      | #40 - #100 | #40  | 0%-100% |
| Very Fine Sands | #100- #200 | #100 | 0%-20%  |
| Silts and Clays | #200       | #200 | 0%-5%   |

The above fill material shall be approved by the local health department. The Contractor is required to provide to the owner a sieve analysis conforming to the above for every load of fill delivered to the site.

- G. Septic Tank Covers: Cast iron manhole frame and cover raised to grade with well tile riser section over all septic tank openings as shown on contract drawings.
- H. Crushed Stone: Crushed stone shall consist of hard, durable fragments of crushed rock and shall be free from clay, organic matter or other objectionable material. Crushed stone shall conform to the gradation table for 1" crushed stone as specified in Article M.0101 of the Standard specifications.

**PART 2 - EXECUTION**

Septic tank, distribution pipe, leaching chambers and other structures and fill material shall be installed in accordance with the contract drawings and Connecticut Public Health Code – Regulations and Technical Standards For Subsurface Sewage Disposal Systems.

It is the intent of the design that the leaching system be installed into existing grades as shown on the plans. Some portions of the leaching system will require fill and the contractor should meet with the engineer and sanitarian on the site to review procedures, and to agree on the fill materials to be used. Inspection and testing of the fill material may be necessary unless an approved commercial sand or gravel bank is to be used which can supply materials which will meet the above criteria. The location of the area to be filled should be marked by the Contractor and approved by the Owner.

The area should be cleared and rough graded. All stumps and large boulders should be removed. Topsoil should be stripped and the area plowed or scarified. Prior to placement of the fill, the bottom surface of the excavation should be scarified. Fill material should be stockpiled at the edge of the excavation until a suitable base of select material has been spread over the entire exposed area. Fill should not be placed during periods of heavy rains, snow storms or freezing temperatures. If water is present at the bottom of the excavation following a period of rain, the excavation shall be dewatered as necessary and rescarified. The excavation for and placement of fill shall extend a minimum of five (5) feet laterally in all directions

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

beyond the outer perimeter of the leaching system and to a depth to make contact with naturally occurring pervious material.

END OF SECTION

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

## SECTION 02660 - WATER DISTRIBUTION SYSTEM

### PART I - GENERAL

#### 1.01 RELATED DOCUMENTS

A. AIA Document A201/CMA, "The General Conditions of the Contract for Construction, Construction Management Edition," 1992 Edition, The American Institute of Architects, Articles 1 through 14 are bound herein and are hereby made a part of the Specifications and shall apply to Contractors and all Subcontractors.

#### 1.02 DESCRIPTION OF THE WORK

A. Water distribution shall include, but is not necessarily limited to, the following:

1. Water distribution/service from existing main and to a point 5 feet outside the building.
2. Domestic water well installation.

#### 1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02100: Site Preparation

B. Section 02230: Utility Excavation and Backfill

#### 1.04 SUBMITTALS

- A. Shop drawings for pipe, fittings, valves, tapping sleeves and service saddles.
- B. As-Built Drawings: Record on a print, all deviations from contract requirements. Record final and actual sizes, locations and elevations of all components. At completion of work, transfer information to transparency to show "As-Built" conditions. Provide As-Built transparency to the owner before final acceptance.

### PART 2 - MATERIALS

#### 1) Water distribution/services

- A. All materials specified shall be new and unused and meet the requirements specified herein and as required and approved by the controlling water authority. Piping shall be the size and length as indicated on drawings.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

- B. Concrete for thrust blocks shall be as specified in article M.03.01 – Class “A” of the Standard Specifications, Form 814A, 1995 Edition.
  - C. Copper tubing for water service lines shall be Type K seamless copper tubing. Requirements for copper tubing shall meet the latest revision of ASTM Specification B88.
  - D. Water service pipe to well shall be polyethylene pipe rated for 160 psi for domestic water use.
  - E. Pipe Bedding: Gravel bedding for water service pipe shall conform to the requirements of Subarticle M.02.06, Grading C of the standard specifications, Form 814A.
- 2) Water supply well installation, permitting and testing.
- A. Drilling of the well must be carried out by a State of Connecticut licensed well driller in a manner which prevents contamination of the groundwater aquifer.
  - B. The well shall be constructed of a 6 inch diameter, 17 pounds per foot steel casing. The casing shall be new and meet the State of Connecticut requirements.
  - C. The void between the casing and the bedrock shall be filled with a sand - cement grout consisting of a mixture of portland cement, water and sand.
  - D. The well shall produce a minimum of 5 gallons per minute at a depth less 300 feet and shall produce a minimum of 3 gallons per minute at a minimum depth of 300 feet.
  - E. The pump shall be a ½ HP, 230 volt, single phase “Goulds” submersible pump model 5GS05 (for 4” or larger wells) or equal. The pump shall be sized according to the head conditions and yield of the well.

**PART 3 – EXECUTION**

- 1) Water distribution/services
- A. Trench excavation and backfill shall meet the requirements of the trench excavation Section 02230 of this specification. Pipe bedding shall conform to Part 2 of this specification.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

- B. A minimum of 18" shall be maintained between the outer edges of any newly installed water main/water services and existing sanitary sewers and storm drains whenever possible. At sanitary sewer and storm drain crossings, the water pipe shall be centered on the crossing so both joints of the water pipe will be as far from the sewer as possible. If the minimum separating distance cannot be maintained, then at least one of the utilities must be sleeved or encased in concrete in accordance with the methods indicated on the plans and in the specifications herein.
- C. The Contractor shall provide at no additional cost appropriate facilities for testing, flushing and disinfection the water mains.
- D. HYDROSTATIC TESTING

Pressure testing and leakage testing shall be carried out in accordance with the Public Health Code requirements.

2) Water supply well installation, permitting and testing.

- A. The drilling of the bedrock wells shall be completed using approved drilling techniques by a CT. licensed well driller.
- B. The water supply well must be constructed and completed in accordance with the Connecticut Well Drilling Code.
- C. The well driller shall obtain and pay for a Water Supply Well Permit from the local health director and prior to drilling in accordance with Public Health Code and shall provide a satisfactory water quality test.
- D. The lump sum bid amount shall include a minimum of 40 feet of well casing and a 300 foot deep well. Unit prices shall be provided for additional costs per the alternates.

END OF SECTION



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

SECTION 02720 - STORM AND GROUNDWATER DRAINAGE

PART 1 - GENERAL

RELATED DOCUMENTS

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

DESCRIPTION OF THE WORK

Storm and groundwater drainage shall include, but is not necessarily limited to the following:

Furnish and install new storm drainage systems as indicated and as detailed on the drawings.

Furnish and install roof drains as indicated and as detailed on the drawings to the building.

Clean the systems at the conclusion of the work of this Contract.

RELATED WORK SPECIFIED ELSEWHERE

Section 02000: Site General Conditions

Section 02100: Site Preparation: Siltation control

Section 02210: Site Earthwork, including bedding and aggregate materials.

Section 02230: Utilities Excavation and Backfill

LOCAL REGULATIONS

All work shall conform to the regulations of the Town of **Voluntown** and the State of Connecticut, each where applicable.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

**SUBMITTALS**

Submit shop drawings for pre-cast concrete structures, metal for structures, as required.

Submit shop drawings and manufacturer's instructions and recommendations for installation for groundwater footing drain pipe.

As-Built Drawings: Record on a print, all deviations from Contract requirements. Record final and actual sizes, locations, and elevations of all components. At completion of work, transfer information to transparency to show "As-Built" conditions. Provide As-Built transparency to the Owner before final acceptance.

**PART 2 - PRODUCTS**

**GENERAL**

**Portland Cement Concrete**

|  |                             |
|--|-----------------------------|
| 3000 PSI (28 day compressive strength) | M.03.01 of Form 816         |
| <u>Cement Concrete Blocks</u>          | M.08.02-3 of Form 816       |
| <u>Cement Concrete Bricks</u>          | M.08.02-2 of Form 816       |
| <u>Clay Brick</u>                      | M.08.02-1 of Form 816       |
| <u>Cement Mortar</u>                   | M.11.04 of Form 816         |
| <u>PVC Pipe</u>                        | M.08.01.28 of Form 816      |
| <u>HDPE</u>                            | M.08.01.25 of Form 816      |
| <u>RipRap</u>                          | Section 7.03.02 of Form 816 |

**PART 3 - EXECUTION**

**GENERAL**

**Catch Basins and Manholes:**

Conform to Section 5.07.03 of Form 816.

Wet and mortar joints in pre-cast units; wet block before laying.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

Fill joints thoroughly with mortar; joints not to exceed 1/4 inch on inside face: point all inside joints.

Set castings in full mortar bed true to lines and grades necessary. Set at temporary grades to provide drainage during construction.

Storm Drainage Lines:

Shape bedding to conform to the lower 10% of the pipe; excavate recesses for bells. Pipes shall have a firm bearing throughout each length; place bell ends uphill.

Joints

Flexible, watertight, rubber-type gaskets. Conform to manufacturer's instructions and recommendation.

Maintain watertight stopper in pipe when pipe-laying is not in progress.

Joints for metal pipe as furnished by pipe manufacturer.

CLEAN UP

Remove accumulated debris and silt from all new drainage structures and pipes, after completion of work.

Notify the Owner in writing when this work is done.

END OF SECTION

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

## SECTION 02740 - MISCELLANEOUS SITE UTILITIES

### PART 1 - GENERAL

#### RELATED DOCUMENTS

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

#### DESCRIPTION OF THE WORK

Miscellaneous utilities shall include, but are not necessarily limited to the following:

Conduits to all site light fixtures for the site lighting system from the building.

Concrete bases for all site light fixtures.

#### RELATED WORK SPECIFIED ELSEWHERE

Section 02000: Site General Conditions

Section 02100: Site Preparation: Siltation Control

Section 02210: Site Earthwork including bedding materials.

#### REGULATIONS

Conform to the regulations of the Utility Company where applicable.

### PART 2 - PRODUCTS

#### GENERAL

Concrete Structures: Article M.03 of Form 816 - Class A.

Polyvinylchloride (PVC) Pipe - Solid: Conform to Schedule 40 PVC.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

**PART 2 - EXECUTION**

**GENERAL**

Pipe shall be installed in accordance with the manufacturer's recommendations and utility company regulations. Piping shall be securely capped at the end of each day's work to prevent entrance of foreign materials.

Pipes shall have a firm bearing throughout each length.

Where the foundation for the pipe is unsuitable, as determined by the Architect, the unsuitable material shall be removed and replaced with gravel fill of such depth as the Architect may direct, or special construction as ordered by the Architect.

Concrete bases for site lighting fixtures to be installed as shown on the drawings.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

## 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:

Traffic parking signs.

Bollards.

Miscellaneous cast-in-place concrete including bases for site lighting.

#### 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.

Steel Pipe: M.10.05.02 of Form 816.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

Traffic Signs: Aluminum, blue and white painted finish, 10 inches x, 14 inches. Comply with all State and local regulations. Manufactured by Sign Stop, 1260 Main Street, East Hartford, CT 06108 or equal approved by the Architect.

**PART 3 - EXECUTION**

Installation shall be in accordance with applicable contract details.

END OF SECTION

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

**PART I – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The General Provisions: of the Contract including General and Supplementary Conditions, and General Requirements apply to work specified in this section.

**1.2 SECTION INCLUDES**

- A. Aluminized chain link fencing and accessories.
- B. Chain link gates and related hardware.
- C. Tubular barrier gates and related hardware.

**1.3 REFERENCES**

- A. ASTM F 567: Installation of Chain Link Fence
- B. ASTM F 626: Fence Fittings.
- C. ASTM A 491: Aluminum-Coated Steel Chain Link Fence Fabric.
- D. ASTM F 900: Industrial and Commercial Horizontal Swing Gates.
- E. ASTM F 1043: Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
- F. ASTM F 1083: Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures.

**1.4 QUALITY ASSURANCE**

- A. Provide fences and gates as complete units produced by a single manufacturer, including necessary erection accessories, fittings, and fastenings.
- B. Installation shall be performed by the manufacturer or by an experienced chain link fence installer approved by the manufacturer.
- C. Provide a rigid, plumb finished fence structure, with fabric tight and tensioned.

**1.5 SUBMITTALS**

- A. Shop Drawings: Layout of fences, gates with dimensions, details and finishes of components, accessories, and post foundations.
- B. Product Data: Manufacturer's catalog cuts indicated material compliance and specified options.



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

C. Samples:

- a. Fabric: 12" square piece of all specified fabrics and coatings.
- b. Line Post: 8" long section of all scheduled line post sizes and coatings.

1.6 PROJECT CONDITIONS

- A. Verify underground utility locations prior to beginning work. Adjust post locations as necessary.

PART 2 – PRODUCTS

2.1 CHAIN LINK FENCE FABRIC

- A. Helically wound and woven to fence heights indicated on the drawings; Core wire strength 80,000 psi.
  1. Fences and Gates: 2" diamond mesh with a core wire diameter of 0.148" (9 gauge) and a breakload of 1290 lbf.
  2. Aluminum-Coated Steel Fabric: The base metal of the fabric shall be of steel wire having a minimum tensile strength of 80,000 psi (550 megapascals), coated with aluminum alloy applied at the rate of not less than 0.40 ounces/square foot (122 grams/square meter) of uncoated wire surface.
- B. Selvage: knuckled top and bottom.

2.2 STEEL FENCE FRAMING AND FITTINGS

- A. Steel pipe –sized as scheduled on the drawings.
- B. All posts, braces, anchors, plates and other devices shall be standard commercial type, hot dip galvanized with zinc on all inner and outer surfaces. The zinc coating shall weigh not less than 2.0 ounces/square foot (610-grams/square meter) when tested in accordance with AASHTO T 65. or shall be in accordance with AASHTO M181, Class 2

2.3 ACCESSORIES

- A. Chain link fence accessories: ASTM F 626. Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.
- B. Post Caps: Formed steel, cast malleable iron, or aluminum alloy cap for tubular posts to provide weather tight closure. Provide dome caps for

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

terminal posts. Provide loop caps for line posts to permit passage of top rail.

- C. Top rail and brace ends: Formed steel, malleable or cast iron; for connection of rail and brace to terminal posts.
- D. Top rail sleeves: 6" sleeve allowing for expansion and contraction of top rail.
- E. Wire ties: 9 gauge (0.148" galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge (0.092") for rails and braces. Hop ring ties of 12-1/2 gauge (0.0985") for attachment of fabric to tension wire. Shall be double twisted.
- F. Brace and tension bands: Pressed steel.
- G. Tension bars: One piece lengths equal to 2 inches less than full height of fabric, with a minimum cross-section of 3/16" x 3/4". Provide tension bars where chain link fabric meets terminal posts.
- H. Tension wire: Thermally fused vinyl (Permafused) applied to metallic coated steel wire, 7 gauge (0.177") diameter core wire with tensile strength of 75,000 psi.
- I. Truss rods: Steel rods with minimum diameter of 5/16".
- J. Nuts and bolts: galvanized. Field-coat with PVC touch up paint.

**2.4 SETTING MATERIALS**

- A. Concrete: CDOT Form 816-2004, Article M.03.01; Class "A".
- B. Grout: CDOT Form 816-2004, Article M.03.01-12; Non-shrink, non-staining grout.

**2.5 CHAIN LINK ROLLING GATES**

- A. Rolling gate material shall conform to the above specification and the contract drawing details.

**2.6 Stockade Fence: Stockade fence in accordance with the drawing details.**

**PART 3 – EXECUTION**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

**3.1 EXECUTION**

- A. Verify areas to receive fencing are completed to final grades and elevations.

**3.2 CHAIN LINK FENCE FRAMING INSTALLATION**

- A. Install chain link fence in accordance with ASTM F 567 and manufacturer's instructions.
- B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30 degrees or more.
- C. Space line posts uniformly at 10' on center.
- D. Concrete set all terminal and line posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than outside dimension of post, and depths approximately 6" deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom below surface to depth as detailed in firm, undisturbed soil. Place concrete around posts in a continuous pour and tamp to consolidate. Stop footing below grade to allow for cover with finished surface material. Trowel finish around post. Slope to direct water away from posts.
- E. If solid ledge rock is encountered, the posts shall be set in holes drill into the rock. Depth of hole shall be 12" minimum for posts with a largest cross section of up to 4". Minimum depth of hole for larger posts shall be three times the largest cross section of the post. Diameter of holes shall be ½" greater than the largest cross section of the post. Half-fill the void with grout and force post to bottom of hole and plumb. Thoroughly work additional grout into the hole to eliminate all voids. Crown the grout to shed water.
- F. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.
- G. Before installing fence components on posts, allow the concrete to attain at least 75% of its 28-day strength. Allow 7 days minimum.
- H. Bracing: Install horizontal pipe brace at mid-height, on each side of terminal posts. Firmly attach with fittings. Install diagonal truss rods at these points. Adjust truss rod, ensuring posts remain plumb.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

- I. Top rail: Support the top rail at each post so that a continuous brace from end to end of each stretch of fence is formed. Securely fasten the top rail to the terminal posts and join with sleeves at approximately every 20 feet to allow for expansion and contraction.
- J. Center Rails, for fabric height 12' and over: Install mid rails between posts with fittings and accessories.
- K. Bottom Rails: Install bottom rails as detailed between posts with fittings and accessories.

**3.3 CHAIN LINK FABRIC INSTALLATION**

- A. Fabric: Install fabric on inside of fence where enclosing activity areas. Attach so that fabric remains in tension after pulling force is released. Leave approximately 1" between finish grade and bottom selvage. Attached fabric with wire ties, to line posts at 15" on center and to rails, braces at 24" on center.
- B. Tension bars: Pull fabric taut; thread tension bar through fabric and attach to terminal posts with bands or clips spaced minimum of 15" on center.

**3.4 ACCESSORIES**

- A. Tie wires: Bend ends of wire to eliminate hazard to persons and clothing.
- B. Fasteners: Install nuts on side of fence opposite fabric side for added security.

**3.5 CHAIN LINK GATE INSTALLATION**

- A. Install gates plumb, level, and secure for full opening without interference.
- B. Attach hardware by means which will prevent unauthorized removal.
- C. Adjust hardware for smooth operation.

**3.6 Stockade Fence**

- 1. Comply with the approved shop drawings. Install fence as indicated on the plans existing.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

2. Provide concrete footing: 4 feet below grade and 12 inches in diameter. Chamfer top edge 1 inch. Top of footing shall be below finish grade.
3. Set fence posts plumb. Fill footing with concrete.

END OF SECTION

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

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.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

SECTION 02910 - PLANTINGS

PART 1 - GENERAL

RELATED DOCUMENTS:

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

American National Standards Institute (ANSI): ANSI Z60. 1 Nursery Stock

DELIVERY, STORAGE, AND HANDLING:

Plant Delivery: When delivered, plants shall have labels stating plant names and sizes; labels shall be legible for at least 60 days. Groups of plants may be labeled by tagging one plant. Protect plants from damage.

Plant Storage: Store and protect plants not planted on the day of arrival as follows:

- A. Shade and protect plants from wind and direct sunlight.
- B. Heel-in bare root plants.
- C. Protect balled and burlapped (B&B) plants from freezing and drying out. Provide covering that allows air circulation.
- D. Keep plants moist until planted.

Plant Handling: Do not drop materials from vehicles.

PART 2 - PRODUCTS

PLANTINGS:

Plants: ANSI Z60. 1. Minimum plant sizes before pruning and with branches in normal position shall be as stated on the drawings, based on the average width or height of the plant specified in ANSI Z60. 1. Plants of the same specified size shall be uniform in size and character of growth. Plants shall be well-branched, well-formed, sound, vigorous, healthy, and free of disease, sunscald, windburn, abrasion, harmful insects or insect eggs, and have healthy, unbroken root systems. Deciduous trees and shrubs shall be symmetrically developed and of uniform growth, with straight boles or stems and no disfigurements. Evergreen trees and shrubs shall have well-developed symmetrical tops with typical spread of branches for each species or variety. Container grown plants shall

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, Ct.**

have sufficient root growth to hold soil intact when removed from containers. Root bound plants are not acceptable.

Planting Soil: Use the excavated material.

Fertilizer: As recommended in writing, by the plant supplier.

Membrane: Landscape fabric.

Granular Fill: Uniformly graded clean sand, stone, gravel, or stone screenings.

Stakes: Rough sawn hardwood free of knots, rot, cross grain, bark, long slivers, or other defects that impair strength.

**PART 3 - EXECUTION**

Seasons and Conditions: According to the written instructions of the local USDA Soil Conservation Service agent. Do not plant when the ground is frozen or covered with snow.

Planting: Set plants at the depth they were grown, on a 6-inch hand-compacted layer of soil.

END OF SECTION



**SECTION 01410 – SPECIAL INSPECTION AND STRUCTURAL TESTING**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Special Inspections and Structural Testing shall be in accordance with Chapter 17 of the Connecticut State Building Code.

**1.2 QUALIFICATIONS**

- A. The Special Inspector shall be a Professional Engineer licensed in the State of Connecticut who is approved by the Structural Engineer of Record (SER), Owner, and Building Official.
- B. The testing laboratory shall be NVLAP accredited and approved by the Structural Engineer of Record (SER), Owner, and Building Official.
- C. The testing laboratory shall maintain a full time Professional Engineer licensed in the State of Connecticut on staff who shall verify all test reports. The Professional Engineer shall be responsible for the verifying qualifications of the testing technicians and shall be in responsible charge of the field and laboratory testing operations.
- D. Special Inspections shall be performed by inspectors who are either Professional Engineers (P.E.) or Engineers-In-Training (EIT) with an education and background in structural engineering except as indicated below.
1. Special Inspections of soils and foundations may be performed by inspectors who are either Professional Engineers (P.E.) or Engineers-In-Training (EIT) with an education and background in geotechnical engineering.
  2. Technicians performing sampling and testing of concrete shall be ACI certified Concrete Field Testing Technicians - Grade 1.
  3. Inspectors performing inspections of concrete work may be ACI certified Concrete Construction Inspectors or International Code Council certified reinforced concrete special inspection in lieu of being a P.E. or EIT.
  4. Technicians performing tests or inspections of welds shall be AWS Certified Welding Inspectors, technicians performing ultrasonic testing shall also be certified as an ASNT Non-destructive Testing Technician Level II or Level III technician.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

5. Technicians performing standard tests described by specific ASTM Standards shall have training in the performance of such tests and must be able to demonstrate either by oral or written examination competence for the test to be conducted. They shall be under the supervision of a Professional Engineer and shall not be permitted to independently evaluate test results.

### **1.3 SUBMITTALS**

- A. The Special Inspector and Testing Laboratory shall submit to the SER, Owner, and Building Official for review a copy of their qualifications which shall include the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.
- B. The Special Inspector and Testing Laboratory shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of the Subcontractors whose work will be inspected or tested.

### **1.4 PAYMENT**

- A. The Owner shall engage and pay for the services of the Special Inspector and Testing Laboratory directly. The Contractor shall be responsible for coordinating testing.
- B. If any materials which require Special Inspections are fabricated in a plant which is not located within 50 miles of the project location, the Contractor shall be responsible for the travel expenses of the Special Inspector or Testing Laboratory.
- C. The Contractor shall be responsible for the cost of any retesting or reinspection of work which fails to comply with the requirements of the Contract Documents.

### **1.5 CONTRACTOR RESPONSIBILITIES**

- A. The Contractor shall cooperate with the Special Inspector and his agents so that the Special Inspections and testing may be performed without hindrance.
- B. The Contractor shall notify the Special Inspector or Testing Laboratory at least 24 hours in advance of a required inspection or test.
- C. The Contractor shall provide incidental labor and facilities to provide access to the work to be inspected or tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- D. The Contractor shall keep at the project site the latest set of construction drawings, field sketches, approved shop drawings, statement of special inspections, and specifications for use by the inspectors and testing technicians.
- E. The Special Inspection program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control program.
- F. The Contractor shall be solely responsible for construction site safety.

**1.6 LIMITS ON AUTHORITY**

- A. The Special Inspector or Testing Laboratory may not release, revoke, alter, or enlarge on the requirements of the Contract Documents.
- B. The Special Inspector or Testing Laboratory will not have control over the Contractor's means and methods of construction.
- C. The Special Inspector or Testing Laboratory shall not be responsible for construction site safety.
- D. The Special Inspector or Testing Laboratory has no authority to stop the work.

**1.7 STATEMENT OF SPECIAL INSPECTIONS**

- A. The Statement of Special Inspections shall be prepared by the Structural Engineer of Record (SER) per Connecticut Statute. CASE Form 101 - 2004 shall be used for the Statement of Special Inspections.
- B. The Statement of Special Inspections form shall be submitted with the application for Building Permit.

**1.8 - RECORDS AND REPORTS**

- A. Detailed reports shall be prepared of each inspection or test. Reports shall include:
  - 1. Date of test or inspection
  - 2. Name of inspector or technician
  - 3. Location of specific areas tested or inspected
  - 4. Description of test or inspection and results
  - 5. Applicable ASTM standard
  - 6. Weather conditions
  - 7. Professional Engineer's stamp and signature

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- B. Interim reports from Special Inspector shall be submitted at the conclusion of each phase of work. Reports for all inspections and tests shall be received by the Building Official.
- C. Reports shall be addressed to the Building Official with copies sent to the SER, Architect, and Contractor.
- D. Any discrepancies from the Contract Documents found during the Special Inspection phase shall be immediately reported to the Contractor. If the discrepancies are not corrected, the Special Inspector Coordinator shall notify the SER and Building Official by close of phase.
- E. The Testing Laboratory shall immediately notify the SER by telephone or fax of any test results which fail to comply with the requirements of the Contract Documents.
- F. Reports shall be submitted within 7 days of the inspection or test. Hand written reports may be submitted if final typed copies are not available.
- G. At the completion of the work requiring Special Inspections, each inspection agency and testing laboratory shall provide a statement to the Special Inspector that all work was completed in substantial conformance with the Contract Documents and that all appropriate inspections and tests were performed.

**1.9 FINAL REPORT OF SPECIAL INSPECTIONS**

- A. The Final Report of Special Inspections shall be completed by the Special Inspector and submitted to the SER and Building Official prior to the issuance of a Certificate of Use and Occupancy.
- B. CEPP/SEC Form 102 - 1999 shall be used for the Final Report of Special Inspections.
- C. The Final Report of Special Inspections will verify that all required inspections have been performed and will itemize any discrepancies which were not corrected or resolved.

**1.10 SCHEDULE OF INSPECTIONS AND TESTS**

- A. Required inspections and tests are described in the attached Schedule of Special Inspections and in the individual specification sections for the items to be inspected or tested.

**END OF SECTION 01410**

## **SECTION 03300 – CAST-IN-PLACE REINFORCED CONCRETE**

### **PART I - GENERAL**

#### **1.1 RELATED DOCUMENTS:**

Contract forms, conditions of the contract, general conditions, and Division 1 General Requirements are hereby made a part of this section as fully as if repeated herein.

#### **1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's product data, as applicable.
- B. Reinforcing Steel Certifications: Submit mill test certificates for all reinforcing steel furnished under this section, showing physical and chemical analysis. Include in chemical analysis for steel to be welded the percentages of carbon, manganese, copper, nickel, and chromium, and optionally the percentages of molybdenum and vanadium.
- C. Aggregates: Submit test reports for each nominal aggregate size concrete showing compliance with specified quality and gradation in accordance with ASTM C 33 and any additional requirements contained in this specification.
- D. Concrete Quality Control Submittals: Submit the following information related to the quality control assurance requirements specified:
  - 1. Design Data: Submit proposed mix designs and test data before concrete operations begin. Identify for each mix submitted the method by which proportions have been selected.
    - a. For mix designs based on field experience, include individual strength test results, standard deviation, and the required average compressive strength calculations.
    - b. For mix designs based on trial mixtures, include trial mix proportions, test results, and graphical analysis and show required average compressive strength calculations
    - c. Indicate quantity of each ingredient per cubic yard of concrete.
    - d. Indicate type and quantity of admixtures proposed or required.
  - 2. Certifications: Provide certification from manufacturer's of concrete admixtures that chloride content complies with specified requirements.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

3. Placement Schedule: Submit concrete placement schedule prior to start of any concrete placement operations. Include location of all joints indicated on drawings, plus anticipated construction joints.
4. Delivery Tickets: Submit copies of delivery tickets complying with ASTM C94 for each load of concrete delivered to the site.
5. Cold Weather Concreting: Submit, well in advance, a description of planned protective measures.
6. Hot Weather Concreting: Submit, well in advance, a description of planned protective measures.

### **1.3 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with the following documents, except where requirements of the contract documents or of governing codes and governing authorities are more stringent:
  1. ACI 301
  2. ACI 318
  3. ACI 302
  4. CRSI Manual of Standard Practice.
- B. Testing Agency Services: Owner will engage testing agency to conduct tests and perform other services specified for quality control during construction.
- C. Source of Materials: Obtain materials of each type from the same source during the project.

### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Store cementitious materials in a dry, weathertight location. Maintain accurate records of shipment and use.
- B. Store aggregates to permit free drainage and to avoid contamination with deleterious matter or other aggregates. When stockpiled on ground, discard bottom 6 inches of pile.
- C. Handle aggregates to avoid segregation.
- D. Deliver reinforcement to project site bundled and tagged with metal tags indicating bar size, lengths, and other data corresponding to information shown on the placement drawings.
- E. Store concrete reinforcement materials to prevent damage and accumulation of dirt or rust.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

## **1.5 - PROJECT CONDITIONS**

- A. Cold Weather Concreting: Comply fully with the recommendations of ACI 306. Well in advance of proposed concreting operations, advise the engineer of proposed protective measures including, but not limited to heating of materials, heated enclosures, and insulating blankets.
- B. Hot-weather Concreting: Comply fully with the recommendations of ACI 305R. Well in advance of proposed concreting operations, advise the engineer of proposed protective measures including, but not limited to cooling of materials, placement during evening to dawn hours, fogging during finishing and curing, shading, and windbreaks.

## **PART 2 - PRODUCTS**

### **2.1 FORMWORK**

- A. Facing Materials:
  - 1. Unexposed finish concrete: Any standard form materials that produce structurally sound concrete.
  - 2. Exposed and textured finish concrete: Materials selected to offer optimum smooth, stain-free final appearance and minimum number of joints.
- B. Formwork Accessories:
  - 1. Form coating: Form release agent that will not adversely affect concrete surfaces or prevent subsequent application of concrete coatings.
  - 2. Metal ties: Commercially manufactured types; cone snap ties, taper removable bolt, or other type which will leave no metal closer than 1-1/2 inches from surface of concrete when forms are removed, leaving not more than a 1-inch-diameter hole in concrete surface.
  - 3. Embedded steel accessories: Galvanized where located less than 2 inches clear from galvanized reinforcing.
  - 4. Fillets: Wood or plastic fillets for chamfered corners, in maximum lengths possible.
  - 5. Isolation Material: Polystyrene insulation of required size and thickness.

### **2.2 - REINFORCING MATERIALS**

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- A. Reinforcing Steel: ASTM A 615, Grade 60.
- B. Smooth dowels: ASTM A615, Grade 60, Plain billet steel free of burrs or deformations.
- C. Welded Wire Fabric: ASTM A 185, cold-drawn steel, plain.
- D. Reinforcing Accessories:
  - 1. Tie wire: Black annealed type, 16-1/2 gage or heavier.
  - 2. Supports: Bar supports conforming to specifications of CRSI "Manual of Standard Practice."
    - a. Class 1 (plastic protected) at all formed surfaces which will be exposed to weather.
    - b. Class 1 (plastic protected) or Class 2 (stainless steel protected) at all formed surfaces which will be exposed to view but not to weather.
    - c. Class 3 supports equipped with sand plates, where concrete will be cast against earth.
- E. Epoxy Coating: ASTM A775

## **2.3 CONCRETE MATERIALS**

- A. Portland Cement: ASTM C 150, and as follows:
  - 1. Type I, except where other type is specifically permitted or required.
    - a. Type I may be replaced by Type III (high early strength) for concrete placed during cold weather.
- B. Water: Potable
- C. Aggregates: Normal weight concrete: ASTM C 33.
- D. Admixtures - General: Admixtures which result in more than 0.1 percent of soluble chloride ions by weight of cement are prohibited.
- E. Air-Entraining Mixture: ASTM C 260 and certified by manufacturer for compatibility with other mix components.
- F. Water Reducing Admixture: ASTM C 494, Type A.
- G. Water Reducing, Retarder Admixture: ASTM C 494, Type D.
- H. Water Reducing and Accelerating Admixtures: ASTM C 494, Type E.



**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- I. High Range Water Reducing Admixture (Superplasticizer): ASTM C 494, Type F or G.
- J. Synthetic Fiber Reinforcement: Fibermesh 1 (ASTM C 1116, TYPE III)

## **2.4 MISCELLANEOUS MATERIALS AND ACCESSORIES**

- A. Vapor Retarder: Clear 10-mil thick polyolefin.
- B. Waterstop: 1" x 3/4" Bentonite clay continuous strip, Volclay Waterstop-RX, or equal.
- C. Nonshrink Grout: ASTM C 1107.
  - 1. Type: Provide non-metallic type only. 2-day compressive strength of 2400 psi, 28-day compressive strength of 7000 psi.
- D. Moisture-Retaining Cover: Hydracure covers as manufactured by PNA Construction Technologies or approved equal.
- E. Liquid Curing Compounds: Comply with ASTM C 309, Type I. Prior to use, verify compatibility of curing compound with floor finishes.
- F. Contraction / Construction Joint Filler: A self leveling, flexible epoxy resin sealer shall be used to fill all construction / control joints in the building slab. Joint material shall be 100% solids, and have a minimum hardness of 50 (ASTM D-2240).
- G. Anchor Bolts: ASTM A36; with ASTM A563 hex nuts and flat washers.
- H. Epoxy Coating: Sikagard 62 broadcast overlay. Color gray. Install per manufacturer's specifications.

## **2.5 CONCRETE MIX DESIGN**

- A. Mix Design Review: Do not begin concrete operations until proposed mixes have been reviewed by the engineer.
- B. Proportioning of Normal Weight Concrete: Comply with recommendations of ACI 211.1.
- C. Required Average Strength: For each type and strength of concrete, establish the required average strength of the design mix on the basis of either field experience or trial mixtures as specified in ACI 301, and proportion mixes accordingly. If trial mixtures method is used, employ an independent testing agency acceptable to the engineer for preparing and reporting proposed mix designs.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

**D. Admixtures:**

1. Air Entraining Admixture: Add at rate to achieve specified air content.
2. Water-reducing admixture: Add as required for placement and workability.
3. Water-reducing and retarding admixture: Add as required in concrete mixes to be placed at ambient temperatures above 90 degrees F.
4. Water-reducing and accelerating admixture: Add as required in concrete mixes to be placed at ambient temperatures below 50 degrees F.
5. High-range water-reducing admixture (superplasticizer): Add as required to achieve a 7 inch slump for all concrete that will be placed against a formliner. Add as required to concrete mix designs for slab on grade as required to meet the slump limitations shown on the contract drawings.
6. Do not use admixtures not specified or approved.

**E. Concrete Mix Design: Refer to Contract Drawings.**

- G. Mix Adjustments:** Provided that no additional expense to owner is involved, contractor may submit for engineer's approval requires for adjustment to approved concrete mixes when circumstances such as changed project conditions, weather, or unfavorable test results occur. Include laboratory test data substantiating specified properties with mix adjustment requests.

**2.6 CONTROL OF MIX IN FIELD**

- A. Slump:** A tolerance up to 1 inch above the specified will be permitted for 1 batch in 5 consecutive batches tested. Concrete for lower than that specified may be used, provided proper placing and consolidation is obtained.
1. If slump upon arrival at the site is lower than 1 inch below the specified value, one addition of water with ASTM C 94 will be permitted to bring the slump within tolerance, provided that:
    - a. A positive means is available to measure the amount of water added at the site.
    - b. The specified maximum water content is not exceeded.
    - c. Not more than 45 minutes since batching has elapsed.
- B. Air Content:** A tolerance of plus or minus 1½ percent of that specified will be allowed for field measurements.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- C. Do not use batches that exceed tolerances.

**2.7 - CONCRETE MIXING**

- A. Transit Mixers: Mix concrete in transit mixers, complying with the requirements of ASTM C 94.
1. At ambient temperatures of 85 to 90 degrees F, reduce mixing and delivery time to 75 minutes.
  2. At ambient temperatures above 90 degrees F, reduce mixing and delivery time to 60 minutes.

**PART 3 - EXECUTION**

**3.1 - CONCRETE FORM PREPARATION**

- A. General: Comply with requirements of ACI 301 for formwork, and as herein specified. The contractor is responsible for design, engineering, and construction of formwork, and for its timely removal.
- B. Earth Forms: Earth forms are not permitted unless shown on contract drawings or approved in writing by the Structural Engineer.
- C. Design: Design and fabricate forms for easy removal, without impact, shock, or damage to concrete surfaces or other portions of the work. Design to support all applied loads until concrete is adequately cured, within allowable tolerances and deflection limits.
- D. Construction: Construct and brace formwork to accurately achieve end results required by contract documents, with all elements properly located and free of distortion. Provide for necessary openings, inserts, anchorages, and other features shown on otherwise required.
1. Joints: Minimize form joints and make watertight to prevent leakage of concrete. Align joints symmetrically at exposed conditions.
  2. Chamfers: Provide chamfered edges and corners at exposed locations, unless specifically indicated otherwise on the drawings.
  3. Permanent openings: Provide openings to accommodate work of other trades, sized and located accurately. Securely support items built into forms; provide additional bracing at openings and discontinuities in formwork.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

4. Temporary openings: Provide temporary openings for cleaning and inspection in most inconspicuous locations at base of forms, closed with tight-fitting panels designed to minimize appearance of joints in finished concrete work.
- E. Tolerances for Formed Surfaces: Comply with minimum tolerances established in ACI 117, unless more stringent requirements are indicated on the drawings.
- F. Release Agent: Provide either form materials with factory-applied non absorptive liner or field-applied form coating. If field-applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use. Rust on form surfaces is unacceptable.
- G. Rustication Strips: Install formliner and rustication strips in accordance with manufacturer's guidelines. Seal all joints with a non staining material capable of maintaining joint integrity.

### **3.2 - REMOVAL OF FORMS AND SUPPORTS**

- A. Non-Load-Bearing Formwork: Provided that concrete has hardened sufficiently that it will not be damaged, forms not actually supporting weight of concrete or weight of soffit forms may be removed after concrete has cured at not less than 50 degrees F for 24 hours. Maintain curing and protection operations after form removal.
- B. Keep supports in place until heavy loads due to construction operations have been removed.

### **3.3 - PLACING REINFORCEMENT**

- A. General: Comply with requirements of ACI 301 and as herein specified.
- B. Preparation: Clean reinforcement of loose rust and mill scale, soil, and other materials which adversely affect bond with concrete.
- C. Placement: Place reinforcement to achieve not less than minimum concrete coverages required for protection. Accurately position, support, and secure reinforcement against displacement. Provide Class B tension lap splices complying with ACI 318 unless otherwise indicated. Do not field-bend partially embedded bars unless otherwise indicated or approved.
  1. Use approved bar supports and tie wire, as required. Set wire ties to avoid contact with or penetration of exposed concrete surfaces. Tack welding of reinforcing is not permitted.
  2. Wire fabric: Install in maximum lengths possible, lapping adjoining pieces not less than one full mesh. offset end laps to prevent continuous laps in either direction, and splice laps with tie wire.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

3. Smooth Dowels: Install smooth dowels perpendicular to formed surface. Secure dowels in place prior to placement of concrete.
- D. Welding: Welding of reinforcement is not permitted, except with the Engineer's specific approval.

### **3.4 - FIELD QUALITY CONTROL - REINFORCING STEEL**

- A. Inspection of the in-place reinforcing steel and its conformance with the contract documents shall be performed by an inspection service designated by the Owner, and unless otherwise noted, all costs and expenses occasioned by the employment of such inspection service shall be paid by the Owner.
- B. Inspection service to inspect all reinforcing placement for its conformance to the contract documents. If reinforcing does not conform to contract documents, then the Inspection service is to notify the contractor of non conforming items. If the contractor fails to remedy the non conforming items, then the Inspection service is to report to the Engineer, by phone and in writing, prior to the start of concrete placement.
- C. The Contractor is to cooperate with the Inspection Service and the Engineer to ensure that the reinforcing is placed properly. Contractor to notify Inspection Service and Engineer 24 hours prior to the time that reinforcing can no longer be inspected due to formwork placement or concreting operations.
- D. Contractor to rectify reinforcing placement errors that are identified by the Inspection Service and/or Engineer at no additional costs to the Owner.

### **3.5 - VAPOR RETARDER INSTALLATION**

- A. General: Place vapor retarder sheet over prepared base material, aligning longer dimension parallel to direction of pour and lapped 6 inches. Seal joints with appropriate tape recommended by the vapor retarder supplier.

### **3.6 - JOINT CONSTRUCTION**

- A. Construction Joints: Locate and install construction joints as indicated on drawings. If construction joints are not indicated, locate in manner which will not impair strength and will have least impact on appearance, as acceptable to the engineer.
1. Keyways: Provide keyways not less than 1-1/2 inches deep at footings, walls and beams.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

2. Reinforcement: Continue reinforcement across and perpendicular to construction joints, unless details specifically indicate otherwise.
  3. Waterstops: Provide waterstops as indicated, installing to form continuous, watertight dam, with field joints fabricated in strict accordance with manufacturer's instructions.
- B. Isolation Joints: Construct isolation joints in slabs poured on grade at points of contact with vertical components, such as foundation walls and column pedestals. Install expansion joint filler to full concrete depth. Recess top edge 1/8 inch where joints are unsealed.
- C. Expansion Joints: Construct expansion joints where indicated. Install expansion joint filler to full depth of concrete. Recess edge of filler to depth indicated to receive joint filler specified.
- D. Control Joints: Construct control joints in poured slabs on grade as shown on the drawings. If no pattern is shown, divide slab in a square or rectangular pattern, arranged to suit layout and compatible with finish floor covering, but having a maximum area of 500 square feet. Joints shall be so located as to conform to joint pattern in areas which are to receive ceramic tile type of finish. If a rectangular pattern is used, long dimension shall not exceed short dimension by more than 50%.
1. Saw Cuts: Shall be cut with power saws equipped with shatterproof abrasive or diamond rimmed blades. Unless otherwise shown on the drawings, cut 1/8" wide joints into concrete, one-fourth the depth of the slab, performed as soon as possible after slab finishing when cutting action will not tear, abrade, dislodge aggregate, or otherwise damage the concrete surface and before the concrete develops random contraction cracks.
  2. To protect control joints and to allow for curing, control joints shall be temporarily filled with sand. Blow out sand prior to application of semi-rigid epoxy.
  3. All control joints shall be filled full depth with specified epoxy resin (slab shall be at least 60 days old before application and shall be installed according to all manufacturers recommendations, especially with regard to surface preparation at a minimum, concrete joints shall be cleaned and prepared to achieve a laitance and contaminant free open texture surface by blast cleaning or equivalent mechanical means.

### **3.7 - INSTALLATION OF EMBEDDED ITEMS**

- A. General: Set anchorage devices and other items required for other work connected to or supported by cast-in-place concrete, using templates, setting drawings, and instructions from suppliers of items to be embedded. Set edge forms and intermediate screeds as necessary to achieve final elevations indicated for finished slab surfaces.

### **3.8 - CONCRETE PLACEMENT**

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- A. Preparation: Provide materials necessary to ensure adequate protection of concrete during inclement weather before beginning of installation of concrete.
- B. Inspection: Before beginning concrete placement, inspect formwork, reinforcing steel, and items to be embedded, verifying that all such work has been completed.
- C. Placement - General: Comply with requirements of ACI 304 and as follows:
  - 1. Schedule continuous placement of concrete to prevent the formation of cold joints.
  - 2. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
  - 3. Deposit concrete as close as possible to its final location, to avoid segregation.
- D. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
  - 1. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.
  - 2. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregate.
  - 3. Do not use vibrators to move concrete laterally.
- E. Slab Placement: Schedule continuous placement and consolidation of concrete within planned construction joints.
  - 1. Thoroughly consolidate concrete without displacing reinforcement or embedded items, using internal vibrators, vibrating screeds, roller pipe screeds, or other means acceptable to the engineer.
  - 2. Strike off and level concrete slab surfaces, using highway straight edges, darbies, or bull floats before water can collect on surface. Do not work concrete further until finishing operations are commenced.
- F. Cold Weather Placement: Comply with recommendations of ACI 306 when air temperatures are expected to drop below 40 degrees F either during concrete placement operations or before concrete has cured.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

1. Do not use frozen or ice-laden materials.
  2. Do not place concrete on frozen substrates.
- G. Hot Weather Placement: Comply with recommendations of ACI 305R when ambient temperature before, during, or after concrete placement is expected to exceed 90 degrees F or when combinations high air temperature, low relative humidity, and wind speed are such that the rate of evaporation from freshly poured concrete would otherwise exceed 0.2 pounds per square foot per hour.
1. Do not add water to approved concrete mixes under hot weather conditions.
  2. Provide mixing water at lowest feasible temperature, and provide adequate protection of poured concrete to reduce rate of evaporation.
  3. Use fog nozzle to cool formwork and reinforcing steel immediately prior to placing concrete.

### **3.9 - FINISHING FORMED SURFACES**

- A. Repairs, General: Repair surface defects, including tie holes immediately after removing formwork.
1. Remove honeycombed areas and other defective concrete down to sound concrete, cutting perpendicular to surface or slightly undercutting. Dampen patch location and area surrounding it prior to applying bond compound or patching mortar.
  2. Before bonding compound has dried, apply patching mixture matching original concrete in materials and mix except for omission of coarse aggregate, and using a blend of white and normal portland cement as necessary to achieve color match. Consolidate thoroughly and strike-off slightly higher than surrounding surface.
- B. Textured Form Finish: Repair tie holes and patch defective areas to match pattern created by form construction or form liners.
- C. Unexposed Form Finish: Repair tie holes and patch defective areas. Rub down or chip off fins or other raised areas exceeding 1/4 inch in height.
- D. Exposed Form Finish: Repair and patch defective areas, with fins or other projections completely removed and smoothed.
1. Smooth rubbed finish: Apply to surfaces exposed to the public no later than 24 hours after removal of forms. Wet concrete surfaces to be finished and rub with Carborundum brick or other abrasive until uniform color and texture are achieved. Do not apply separate grout mixture.



**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

2. Contiguous unformed surfaces: Strike smooth and float to a similar texture tops of walls, horizontal offsets, and other unformed surfaces adjacent to or contiguous with formed surfaces. Continue final finish of formed surfaces across unformed surfaces, unless otherwise specifically noted.

### **3.10 - FINISHING SLABS**

#### **A. Finishing Operations - General:**

1. Do not directly apply water to slab surface or dust with cement.
2. Use hand or powered equipment only as recommended in ACI 302.1R.
3. Screeding: Strikeoff to required grade and within surface tolerances indicated. Verify conformance to surface tolerances. Correct deficiencies while concrete is still plastic.
4. Bull Floating: Immediately following screeding, bull float or darby before bleed water appears to eliminate ridges, fill in voids, and embed coarse aggregate. Recheck and correct surface tolerances.
5. Do not perform subsequent finishing until excess bleed water or moisture has disappeared and concrete will support either foot pressure with less than 1/4 inch indentation, or weight of power floats without damaging flatness.
6. Final floating: Float to embed coarse aggregate, to eliminate ridges, to compact concrete, to consolidate mortar at surface, and to achieve uniform, sandy surface. Recheck and correct tolerances.
7. Troweling: Trowel immediately following final floating. Apply first troweling with power trowel except in confined areas, and apply subsequent trowelings with hand trowels. Wait between trowelings to allow concrete to harden. Do not over trowel. Begin final troweling when surface produces a ringing sound as trowel is being moved over it. Consolidate concrete surface by final troweling operation. Completed surface shall be free of trowel marks, uniform in texture and appearance, and within surface tolerance accepted. Grind smooth surface defects which would telegraph through final floor covering system.

#### **B. Float Finish: As specified above.**

#### **C. Broomed Float Finish: After floating and when water sheen has practically disappeared, apply uniform transverse corrugations approximately 1/16 inch deep, without tearing surface.**

#### **D. Trowel Finish: As specified above.**

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

E. Slab Surface Tolerances:

1. Achieve flat, level planes except where grades are indicated. Slope uniformly toward drains.
2. Floated Finishes: Check and level surface plane to tolerances of at least  $F_F = 18$  for flatness and  $F_L = 15$  for levelness per ASTM E 1155.
3. Troweled finishes: Achieve level and flat surface plane, within the following surface tolerances per ASTM E 1155:
  - a. Floor Flatness  $F_F = 20$  (overall), 15 (local).
  - b. Floor Flatness  $F_L = 17$  (overall), 10 (local).

G. Slab Finish Schedule: Apply finishes in the following locations and as otherwise shown on drawings:

1. Float Finish: Surfaces to receive thickset tile bonded to slab.
2. Broomed Float: Sidewalks, steps, platforms, landings, and exterior slabs and ramps not otherwise scheduled.
3. Trowel Finish: Exposed interior floors otherwise not scheduled, surfaces to receive resilient tile, surfaces to receive carpeting, and surfaces to receive wood flooring.
4. Trowel and fine broom: Surfaces to receive thinset tile.

H. Repair of Slab Surfaces: Test slab surfaces for smoothness and to verify surface plane to tolerance specified. Repair defects as follows:

1. High Areas: Correct by grinding concrete after concrete has cured for 14 days.
2. Low areas: Immediately after completion of surface finishing operations, cut out low areas and replace with fresh concrete. Finish repaired areas to match with adjacent concrete. Proprietary patching compounds may be used when approved by the engineer.
3. Crazed or cracked areas: Cut out defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove and defective areas with clean, square cuts. Dampen exposed concrete and apply bonding compound. Mix, place, compact, and finish patching concrete to match adjacent concrete.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

4. Isolated cracks and holes: Groove top of cracks and cut out holes not over 1 inch in diameter. Dampen cleaned concrete surfaces and apply bonding compound; place dry pack or proprietary repair compound acceptable to engineer while bonding compound is still active.
  - a. Dry pack mix: One part portland cement to 2-1/2 parts fine aggregate and enough water as required for handling and placing.
  - b. Install patching mixture and consolidate thoroughly, striking off level with and matching surrounding surface. Do not allow patched areas to dry out prematurely.
5. Underlayment: Leveling of slabs for subsequent application of floor finishes may be achieved by use of specified underlayment material, at contractor's option.

### **3.11 - CONCRETE CURING AND PROTECTION**

A. General:

1. Prevent premature drying of freshly placed concrete, and protect from excessively cold or hot temperatures until concrete has cured.
2. Provide curing of concrete by the method listed and as appropriate to service conditions and type of applied finish in each case.

B. Curing Period:

1. Not less than 7 days for standard cements and mixes.
2. Not less than 4 days for high early strength concrete using Type III cement.

C. Formed Surfaces: Cure formed concrete surfaces by moist curing with forms in place for full curing period. or until forms are removed.

1. Keep wooden or metal forms moist when exposed to the heat of the sun.
2. If forms are removed prior to completion of curing process, continue curing by one of the applicable methods specified.

D. Surfaces Not in Contact with Forms (Slabs on Grade):

1. Start curing as soon as free water has disappeared, but before surface is dry. Place to protect adjacent concrete edges. curing method as follows:
  - a. Continuous curing under moisture retention cover. Initiate wet curing after finishing operations are complete and as soon as marring of concrete surface will not occur. Maintain moisture continuously for a period of 7 days.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- b. Use curing compounds only in locations permitted or requires, and where use will not interfere with other finishes, coatings, or coverings to be applied.
- E. During and following curing period, protect concrete from temperature changes of adjacent air in excess of 5 degrees F per hour and 50 F degrees per 24 hours. Progressively adjust protective measures to provide uniform temperature changes over entire concrete surface.

**3.12 - MISCELLANEOUS CONCRETE ITEMS (AS APPLICABLE)**

- A. Fill-In: Fill in holes and openings left in concrete structures left for passage of work by other trades or after such work is in place. Place such fill-in concrete to blend with existing construction, using same mix and curing compounds.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as indicated on the drawings. Set anchor bolts at correct elevations, complying with diagrams or templates of equipment manufacturer. Grout base plates and foundations as indicated with non-shrink grout.
- C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Screed, tamp, and finish concrete surfaces as scheduled.

**3.13 - CONCRETE REPAIRS**

- A. Perform cosmetic repairs of concrete surfaces as specified under concrete application.
- B. Perform structural repairs with prior approval of engineer for method and procedure, using epoxy-bonded systems. The engineer's approval is required for repair methods using materials other than specified.

**3.14 - QUALITY CONTROL TESTING DURING CONSTRUCTION**

- A. Composite Sampling, and making and curing of specimens, ASTM C 172 and ASTM C 31.
  - 1. Take samples at point of discharge.
  - 2. For pumped concrete, perform sampling and testing at the frequencies specified herein at point of delivery to pump, and perform additional sampling and testing at the same frequency at discharge from line obtained at discharge from line shall be used for acceptance of concrete.
- B. Slump: ASTM 143. One test per strength test and additional tests if concrete consistency changes. Modify testing to comply with ASTM C 94.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- C. Air Content of Normal Weight Concrete: ASTM C 173 or ASTM C 231. One test per strength test performed on normal weight concrete.
- D. Concrete Temperature:
1. Test hourly when air temperature is 40 degrees F or below.
  2. Test hourly when air temperature is 90 degrees F or above.
  3. Test each time a set of strength test specimens is made.
- E. Compressive Strength Tests: ASTM C 39.
1. Compression Test Specimens: Mold and cure one set of 4 standard cylinders for each compressive strength test required. During hot or cold weather concreting, mold an additional cylinder and cure on site using conditions similar to the concrete sampled.
  2. Testing for acceptance of potential strength of as-delivered concrete:
    - a. Obtain samples on a statistically sound, random basis.
    - b. Minimum frequency:
      - i. Once each day a given class is placed, nor less than,
      - ii. Once for each 50 yd<sup>3</sup> of each class placed each day, nor less than,
      - iii. Once for each 2500ft<sup>2</sup> of slab or wall surface area placed each day.
      - iv. When the above testing frequency would provide less than 5 strength tests for a class of concrete during the project, conduct tests from not less than 5 randomly selected batches, or from each batch if fewer than 5.
    - c. Test one specimen per set at 7 days for information unless an earlier age is required.
    - d. Test two specimens per set for acceptance of strength potential; test at 28 days unless other age is specified. The test result shall be the average of the two specimens. If one specimen shows evidence of improper sampling, molding, or testing, the test result shall be the result of the remaining specimen; if both show evidence disregard the test and contact the engineer.
    - e. Retain one specimen from each set for later testing, if required.
    - f. Strength potential of as-delivered concrete will be considered acceptable if all of the following criteria are met:

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- i. No individual test result falls below specified compressive strength by more than 500 psi.
    - ii. Not more than 10 percent of individual test results fall below specified compressive strength  $f'_c$ .
    - iii. Average of any three consecutive test results equals or exceeds the specified compressive strength.
  3. Testing for evaluation of field-curing:
    - a. Frequency: 1 field set of concrete specimens per day for each type of concrete poured during cold weather concreting.
    - b. Mold specimens from same sample used for strength acceptance tests. Field-cure, and test at same age as for strength acceptance tests.
    - c. Evaluate construction and curing procedures and implement corrective action when strength results of field-cured specimens are less than 85 percent of test values of companion laboratory-cured specimens.
  4. Removal of Forms and Supports: Mold additional specimens and field cure with concrete represented; test to determine strength of concrete at proposed time of form and support removal.
- F. Floor Flatness and Floor Levelness: Per ASTM E 1155 for slabs on grade at office area only test shall be performed if requested by Engineer or Owner.
- G. Test Results: Testing agency shall report test results in writing to engineer and contractor within 24 hours of test.
1. Test results shall contain following data:
    - a. Project name, number, and other identification.
    - b. Name of concrete testing agency.
    - c. Date and time of sampling.
    - d. Concrete type and class.
    - e. Location of concrete batch in the completed work.
    - f. All information required by respective ASTM test methods.
  2. Nondestructive testing devices such as impact hammer or sonoscope may be used at engineer's option for assistance in determining probable concrete strength at various locations or for selecting areas to be cored, but such tests shall not be the sole basis for acceptance or rejection.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

3. The testing agency shall make additional tests of in-place concrete as directed by the engineer when test results indicate that specified strength and other concrete characteristics have not been attained.
  - a. Testing agency may conduct tests of cored cylinders complying with ASTM C 42, or tests as directed.
  - b. Cost of additional testing shall be borne by the contractor when unacceptable concrete has been verified.

**END OF SECTION 03300**

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

## **SECTION 05310 - STEEL DECK**

### **PART I - GENERAL**

#### **1.01 SUBMITTALS**

- A. Product Data: Submit deck manufacturer's specifications and product information, indicating compliance with specified requirements.
  - 1. Include Steel Deck Institute certification of manufacturer's deck characteristics.
  - 2. Submit manufacturer's installation instructions, including specific installation sequence.
- B. Shop Drawings: Submit detailed drawings indicating deck types, gage and manufacturer, plan layout, support locations and anchorages; projections; openings and reinforcement; and pertinent details and accessories.
  - 1. Indicate temporary shoring of decking where required.
  - 2. Indicate size, quantity, and location of field-applied shear connectors, as applicable.
- C. Welder Qualifications: Submit evidence that welders employed in the work are currently certified under AWS qualification procedures.

#### **1.02 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with requirements of the following, except where exceeded by the contract documents or requirements of governing authorities:
  - 1. AISI "Specification for the Design of Cold-Formed Steel Structural Members."
  - 2. AWS D1.3 "Structural Welding Code--Sheet Steel."
  - 3. "Steel Deck Institute Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution."
- B. Qualifications: Qualify welding processes and welding operators according to procedures specified in AWS D1.1.



**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- C. Testing: An independent testing agency selected by the architect and paid by the owner will inspect field welds. If testing indicates that welds do not comply with requirements, remove defective work and replace at no additional expense to the owner.
- D. Underwriters Laboratories Label: Provide deck units bearing UL label and marking for specific system detailed, and as listed in UL's "Fire Resistance Directory."

**1.03 STORAGE AND HANDLING**

- A. Storage: Separate sheets and store units on dry wood sleepers, sloped to promote drainage. Cover with waterproof material ventilated to avoid condensation.
- B. Marking: Unless deck units are all of the same gage and yield strength for the project, mark each unit clearly to identify differences.

**PART TWO - PRODUCTS**

**2.01 MATERIALS**

- A. Metal Deck: ASTM A 446, Grade A, galvanized having a field yield point of at least 60,000 psi.
- B. Sheet Metal Accessories: ASTM A 526, galvanized.
- C. Galvanizing: ASTM A 525, G90 coating designation. Weight of galvanizing shall be not less than 0.90 oz. per square foot, total both sides.
- D. Galvanizing Repair Paint: Comply with requirements of Military Specification MIL P-21035B, Type I or II.
- E. Flexible Closure Strips: Manufacturer's standard synthetic rubber.

**2.02 FABRICATION**

- A. Metal Form Deck: Comply with the following:
  - 1. Material: G90 galvanized steel.
    - a. Minimum yield strength: 60,000 psi.
    - b. Minimum metal thickness: 26 gage.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- c. Maximum profile height: 9/16" inches deep as manufactured by Vulcraft, or approved equal.
- 2. Spanning configuration: 3 span.
- 3. Sheet coverage width: Contractor's option.
- 4. Side joints: Interlocking.
- 5. Metal Form Deck Design:
  - a. Decking shall be capable of supporting a uniform distribution live load of 30 lbs. per sq. ft. without live load deflection exceeding L/240 of the span length, center to center of supports, and a uniformly distributed load of 30 lbs. per sq. ft. without exceeding a unit stress of 20,000 psi, with the additional requirements that unless otherwise specifically shown on the drawings, no decking shall be less than 20 gage thickness.
  - b. Deck and fastening shall be designed for uplift forces of a minimum of 10 psf.
- C. Metal Cover Plates: Fabricate covers for abutting deck ends, of same material and gage as deck units, in matching contour, and not less than 6 inches wide.
- D. Metal Closure Strips: Fabricate of same material as deck units and not less than 26 gage to match deck contour and provide tight and closure.
- E. Metal Filler Strips: Fabricate of same material and gage as deck units, in contours as indicated to complete horizontal closure.
- F. Weld Washers: Uncoated mild steel, sized as recommended by manufacturer of steel deck units.

### **PART III EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine field conditions and substrates to receive metal decking, and verify that existing conditions are acceptable before commencing installation.

#### **3.02 INSTALLATION**

- A. General: Install deck units and accessories in compliance with Steel Deck Institute specifications, manufacturer's recommendations, and requirements of this specification

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

section. Fasten deck units to supports promptly after placement and alignment. Do not leave placed sheets unattached at end of working day.

**B. Fastening:**

1. Fasten deck units to steel supporting members as follows:
  - a. Minimum  $\frac{3}{4}$  -inch-diameter fusion “plug” welds or elongated welds of equal strength. Use weld washers when recommended by manufacturer of deck units and when deck metal thickness is less than 0.028 inch in thickness.
  - b. Spacing: 12 inches on center average, but not more than 18 inches apart and not fewer than 2 fasteners at any support.
2. Side laps: At contractor's option, fasten side laps of adjacent deck units using one of the following methods:
  - a.  $\frac{3}{4}$  -inch-diameter fusion “plug” welds.
  - b. TEKS self-drilling metal deck fasteners, using self-tapping machine screws of No. 8 size or larger, as approved by Engineer.

**C. Hanger Slots or Clips:**

1. Provide manufacturer's standard punched hanger slots and clips or hanger clips designed to be supported by edge of deck units, at locations where floor deck units are designed to support ceiling or duct components.
2. Assure that slots or clips are spaced at maximum of 14 inches on center. At walls, provide slots or clips within 8 inches.

**D. Openings:**

1. Cut deck units and accessories to fit snugly around other work penetrating decks.
2. At openings up to 18 inches in either dimension, provide reinforcement and closure strips as shown or as required for strength and rigidity.

**E. Metal Accessories: Fasten metal accessories securely to deck units, using welding or mechanical fasteners as appropriate to conditions.**

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

1. Install metal cover plates at butt joints with gap of more than 1/8 inch.
  2. Install metal closure strips at open, uncovered ends and edges of decking.
  3. Install metal filler strips in voids between decking and other construction.
  4. Install other metal accessories as required to contain wet concrete.
- G. Flexible Closure Strips: Install above walls and partitions angled or perpendicular to direction of deck flutes, using adhesive in compliance with manufacturer's instructions.
- H. Touch-up Painting: After installation of deck units and accessories, wire-brush burned and abraded areas and rust spots and apply touch-up paint. Apply galvanizing repair paint to galvanized surfaces, complying with manufacturer's instructions.

**3.03 CLEANING**

- A. Clear debris from deck before concrete is placed.
- B. Upon completion of work, removal all rubbish, debris, and excess materials from project site.

**END OF SECTION 05310**

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

## **SECTION 05400 - COLD FORMED METAL FRAMING**

### **PART I – GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Stud framing of interior walls.
2. Stud framing of exterior walls.
3. First floor ceiling framing in office area.
4. Accessories such as clips, stiffeners, bridging, bracing, and fasteners.

#### **1.2 SYSTEM DESCRIPTION**

- A.** Size and arrange components and accessories to support dead loads and to withstand live loads and wind loads as required by the State of Connecticut Building Code.
- B.** Maximum Allowable Deflection: Design system to withstand 100 percent loading without deflecting beyond the limits specified below:
1. Interior wall: 1/240 of the span under 5 psf interior wind loading.
  2. Exterior Wall: 1/240 of the span under Components and Cladding Wind Load.
  3. Roof: 1/360 of the span.
  4. Floor: 1/360 of the span.
- C.** Design framing systems to withstand movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperatures.
- D.** Design system to accommodate deflection of building structural members and construction tolerances.

#### **1.3 SUBMITTALS**

- A.** Product Data.
- B.** Shop/Erection Drawings: Show type, weight, location, and spacing of members. Clearly identify attachments and connections using AWS symbols for welds, standard designations for fasteners. Show bracing, supplemental strapping, clips, and other accessories required.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- C. Engineering Calculations: Submit calculations for loadings and stresses of system members and connections. Have calculations signed and sealed by an engineer registered in Connecticut.

#### **1.4 QUALITY ASSURANCE**

- A. Design of Framing Members: Calculate structural characteristics of framing members in compliance with American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members."

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery, store, and handle products in a manner to prevent damage and deterioration, including rust.
- B. Store materials above the ground in a dry area, in manufacturer's original packaging. Keep labels showing product type, name, and grade intact.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Provide products complying with requirements of the contract documents and made by one of the following:
1. Marino Industries Corporation.
  2. Dale/Incor.
  3. Gold Bond Building Products, a National Gypsum Division.
  4. Super Stud
  5. Unimast, Inc. (formerly a part of USG).

#### **2.2 COLD FORMED METAL FRAMING**

- A. Fabricate metal framing units from ASTM A 446, A 570, or A 611 steel sheet.
1. Finish: Galvanized (zinc-coated), Class G60, minimum.
  2. C-Shaped Studs: Provide load-bearing studs fabricated from steel and sized as indicated; C-shaped in cross section, 1.625-inch (1/2" minimum) flange (unless noted otherwise), with flange return lip.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

3. C-Shaped Joists: Provide joists fabricated from steel and sized as indicated; C-Shaped in cross section, 2 inch flange (unless otherwise noted), with (1/2 inch minimum) flange return.
- B. Framing Accessories: Fabricate from minimum 16 gage steel sheet of the type and finish used for framing members. Provide manufacturer's standard configuration for the following accessory items:
1. Bottom track channel.
  2. Top track channel.
  3. Top Deflection track
  4. Clip angles.
  5. Joist bridging
  6. Web stiffeners and horizontal bridging
  7. Rafter clips.

## **2.3 ACCESSORY MATERIALS**

- A. Fasteners:
1. Threaded fasteners: ASTM A 90, hot-dip galvanized.
  2. Anchorage devices: Hot-dip galvanized steel or stainless steel. Acceptable types include:
    - a. Powder actuated fasteners.
    - b. Power-driven anchor screws.
    - c. Sheathing fasteners: ASTM C 954; self-drilling, self-tapping, bugle head galvanized or cadmium-plated steel screws.
- B. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Web Stiffeners: Provide web stiffeners at all joist bearings.
- D. Bridging: Provide bridging at 7'-0" on center for all 2" flanged joist/rafters provide bridging at 5'-0" on center for joists or rafters with a flange less than 2 inches.
- E. Horizontal Bridging: All studs shall have horizontal bridging at 5'-0" maximum spacing.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

A. Installation of cold formed metal framing systems.

1. Verify that inserts, clips, and similar attachment devices installed as work of other sections are located and installed properly.

**3.2 INSTALLATION - GENERAL**

- A. Comply with requirements of ASTM C 1007 except where exceeded by other requirements.
- B. Install cold formed metal framing components in accordance with approved shop/erection drawings and manufacturer's instructions.
- C. Install framing accessories such as web stiffeners, diagonal bracing, and bridging as indicated or required.
- D. Fastening: Join components using screws or bolts. Wire tying of framing elements is prohibited.
- E. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24 inches o.c. spacing for nail or power-driven fasteners or 16 inches o.c. for other types of attachment. Provide fasteners at corners and ends of tracks. Install deflection track under structural steel beams and joists.
- F. Installation of Wall Studs: Secure studs to top and bottom runner tracks by screw fastening at both inside and outside flanges. Exception: Do not fasten the wall studs to top deflection tracks.
- G. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
- H. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.
- I. Frame wall openings larger than 2 feet square with double stud at each jamb of frame except where more than two are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings.



**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

### **3.3 JOIST AND RAFTER FRAMING**

- A. Verify level and secure bearing surfaces for joists.
- B. Make provisions for erection stresses. Provide temporary bracing and alignment.
- C. Set joists parallel and level (or to indicated pitch), with lateral bracing and bridging
- D. Provide web stiffeners at reaction points.

### **3.5 WALL INSTALLATION**

- A. Construct corners using minimum of 3 studs.
- B. Double stud at wall openings, door jambs, and window jambs.
- C. Erect studs one piece, full length. Splicing of studs not permitted. Brace and reinforce to develop full strength.
- D. Make provisions for movement of building structure to prevent transfer of structural load or movement to curtain wall framing system.
- E. Control and Expansion Joints: Provide discontinuous framing at joint using independent studs and separate runner track on either side of joint. Bridging the joint with system components or accessories is prohibited.

### **3.6 WALL SHEATHING**

- A. Install sheathing so that long edges are parallel to studs. Center edges over studs.
- B. Provide solid blocking or metal framing to support horizontal edges which do not bear on horizontal framing members.
- C. Coordinate installation of flashings, anchors, and similar items necessary to construct and weatherproof wall systems.

### **3.7 TOLERANCES**

- A. Maximum Variance from True Position: 1/8 inch.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

B. Maximum Offset of Any Member from Plane: 1/16 inch.

**END OF SECTION 05400**

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

## **SECTION 06100 – ROUGH CARPENTRY**

### **PART 1- GENERAL**

#### **1.1 - RELATED DOCUMENTS**

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

#### **1.2 SUMMARY OF THE WORK:**

Rough Carpentry includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated. Rough carpentry includes the following work items:

1. Roof sheathing
2. Floor sheathing
3. Wood grounds, nailers, and blocking
4. Concealed wood blocking for support of toilet and bathroom accessories

#### **1.3 PRODUCT HANDLING:**

- A. Delivery and storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

#### **1.4 PROJECT CONDITIONS:**

- A. Coordinate Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work. Review all drawings and specification sections to coordinate the needs of all related trades.

### **PART 2 - PRODUCTS**

#### **2.1 DIMENSION LUMBER**

- A. General: Comply with the "American Softwood Lumber Standard" PS-20 and with applicable grading rules of inspection agencies certified by American Lumber Standard Committee (ALSC) Board of Review. Normal sizes are shown or specified.

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- B. Grade stamps: factory-Mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grade rule requirements and identifying grading agency, grade, species, moisture content of time of surfacing and mill.
- C. Blocking lumber: Construction grade size lumber of any species per WCLIB or WWPA. Moisture content 19% maximum. Factory mark with grade stamp of inspection agency required.
- D. Nominal sizes: are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS-20 for moisture content specified for each use.
- E. Dimension, Lumber: In compliance with National Forest Products Association Standard NDS (current edition) National Design Specifications for Wood Construction and in accordance with Design Values Joist and Rafters- Visually graded NLGA grading agency.

## **2.2 SHEATHING**

- A. Roof Sheathing: APA rated sheathing, 3/4". Exposure I.
- B. Subflooring: APA rated sheathing, 3/4" tongue and groove, screwed and glued, Exposure I.

## **2.3 MISCELLANEOUS FASTENERS AND MATERIALS:**

- A. Fasteners and Anchorages: Provide size, type, material and finish as indicted and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommending nails.
- B. Where rough carpentry work is exposed to weather, in ground contact, or in areas of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).
- C. Building Paper: Asphalt saturated felts, non-perforated, ASTM D 226.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL:**

**New Town Garage Building  
Town of Voluntown, Connecticut  
96 Gate Street  
Voluntown, CT**

- A. Discard units of material with defects which might impair quality of work and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
- B. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.
- C. Securely attach carpentry work to substrata by anchoring and fastening as shown and as required by recognized standards.
- D. Countersink nail heads on exposed carpentry work and fill holes.
- E. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side is exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

**3.2 INSTALLATION OF CONSTRUCTION PANELS:**

- A. General: Comply with applicable recommendations contained in Form No. E 30 F, APA Design/Construction Guide - Residential ~ Commercial" for types of construction panels and applications indicated.
- B. Fastening Methods: Fasten gypsum panels with self-drilling self-tapping bugle head type screws. Fasten wood panel with nail or staples to wood framing following recommended nailing schedule.
- C. Plywood Backing Panels: Nail to supports
- D. Holes, Cuts and notches not previously approved by the manufacturer shall not be permitted.
- E. Provide minimum fasteners required by manufacturers for properly securing members in place, ready to receive design forces.

**3.3 FASTENING METHODS:**

- A. Roof Sheathing: Screw along panel edges and at intermediate supports. Provide support at unsupported long edges with "Plyclips" or wood blocking for any panels that have been ripped to less than 3'-0" wide.
- B. Floor Sheathing: Screw along panel edges and at intermediate supports

**END OF SECTION 06100**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**TABLE OF CONTENTS**

**Division 7 - Thermal and Moisture Protection**

|                                 |     |
|---------------------------------|-----|
| 07200 Insulation                | 1-5 |
| 07840 Firestopping              | 1-6 |
| 07915 Sealant, Caulking & Seals | 1-3 |

**Division 8 - Doors and Windows**

|                                |                       |
|--------------------------------|-----------------------|
| 08110 Steel Doors and Frames   | 1-5                   |
| 08200 Wood Doors               | 1-5                   |
| 08310 Access Doors             | 1-3                   |
| 08630 Overhead Sectional doors | 1-4                   |
| 08710 Finish Hardware          | Scheduled on Drawings |
| 08800 Glass and Glazing        | 1-9                   |

**Division 9 - Finishes**

|   |      |
|---|------|
| 09250 Gypsum Drywall                    | 1-8  |
| 09300 Ceramic Tile                      | 1-4  |
| 09510 Acoustical Ceiling and Suspension | 1-5  |
| 09650 Resilient Flooring                | 1-6  |
| 09900 Painting                          | 1-10 |

**Division 10 – Specialties**

|                          |     |
|--------------------------|-----|
| 10522 Fire Extinguishers | 1-3 |
| 10800 Toilet Accessories | 1-4 |

**Division 13 - Special Construction**

|                                     |     |
|-------------------------------------|-----|
| 13122 Pre-Engineered Metal Building | 1-9 |
|-------------------------------------|-----|

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 07200 – INSULATION**

### **PART 1 – GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

#### **DESCRIPTION OF WORK:**

Extent insulation work is shown on drawings and indicated by provisions of this section. Applications of insulation specified in this section include the following:

- Batt and or Blanket Insulation
- Fire Safing Insulation
- Rigid Perimeter Insulation
- Sound Attenuation Insulation used for wall, floor/ceiling and ceiling assemblies in indicated sound control locations and details.
- Scheduled Vapor Barrier, either as an integral part of the insulation or as an added application.

*Beyond that insulation indicated as part of the Pre-Engineered Building and its related components.*

#### **QUALITY ASSURANCE:**

**Thermal Resistivity:** Where thermal resistivity properties of insulation materials are designated by r-values they represent the rate of heat flow through a homogenous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures.

**Fire Performance Characteristics:** Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

Surface Burning Characteristics: ASTM E 84.

Fire Resistance Ratings: ASTM E 119.

Combustion Characteristics: ASTM E 136.

#### **SUBMITTALS:**

**Product Data:** Submit manufacturer's product literature and installation instructions for

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

each type of insulation and vapor retarder material required.

**Certified Tests Reports:** With product data, submit copies of certified test reports showing compliance with specified performance values, including r-values (aged values for plastic insulation's), densities, compression strengths, fire performance characteristics, perm ratings, water absorption ratings and similar properties.

**DELIVERY, STORAGE, AND HANDLING:**

General Protection: Protect insulation's from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

Protection for Rigid (Plastic) Insulation:

Do not expose to sunlight, except to extent necessary for period of installation and concealment.

Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

**PART 2 – PRODUCTS**

**ACCEPTABLE MANUFACTURERS:**

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

Manufacturers of Rigid Insulation (wall cavity, under slab):

Construction Products Div., W.R. Grace & Co.

Dow - Blue

Manufacturers of Batt Insulation:

CertainTeed Corp.

Manville Corp.

Owens-Corning Fiberglas Corp.

Manufacturers of Fire Safing Insulation:

Manville Corp.

United States Gypsum Co.

Manufacturers of Sound Attenuation Insulation (SAB):

Certain-Teed Corp. Noise Reducer SAB)



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Owens Corning (SAB)  
J.M. Mineral Wool (SAFB)

**INSULATING MATERIALS:**

General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.

Performed Units: Sizes to fit applications indicated, selected from manufacturer's standard thickness, widths and lengths

Rigid Board Insulation for Cavity walls and Foundations:

Rigid (Extruded Polystyrene) Insulation Rigid, cellular thermal insulation and integral high density skin formed by the extrusion of polystyrene resin in an extrusion process to comply with ASTM C 578 for Type indicated; and as follows: Type IV, 3.0 lb. /cu. ft. min. density, 5 year aged R-value of 5.4 and 5.0 at 40 and 75 dig's (5.4 and 23.9 deg.C), Compressive strength 25 lb/min ASTM D 1621, water absorption 0.1% by Volume ASTM C 272.

Faced Batt / Blanket & Unfaced Batt / Blanket Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:

Mineral Fiber Type: Fibers manufactured from glass.

Combustion Characteristics: Passes ASTM E 136 test.

Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

Thermal Conductivity (k) = 0.27

Faced Batt/Blanket Insulation: Thermal insulation produced by fiber type described below with thermosetting resin to comply with ASTM C665 for type III, Class A (blankets with reflective vapor retarder membrane facing with flame spread of 25 or less) foil - scrim - vapor retarder membrane on one face, respectively.

Mineral Fiber Type: Fibers manufactured from glass.

Combustion Characteristics: Passes ASTM E 136 test.

Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

Thermal Conductivity (k) = 0.27

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Fire Safing Insulation: Semi-rigid, self-supporting, unfaced, blanket insulation composed of mineral fibers (not glass), thermal conductivity of 0.23, and not less than one pound per cubic foot density.

Polyethylene Vapor Wall Retarder: 6 mil polyethylene fiber with laboratory tested vapor transmission rating of 0.2 perms, natural color.

### **PART 3 – EXECUTION**

#### **INSPECTION AND PREPARATION:**

Require Installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

Clean substrates of substances harmful to insulation.

#### **INSTALLATION, GENERAL:**

Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

#### **INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION:**

On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions for location and temperature range. Use type of adhesive recommended by manufacturer of insulation

#### **INSTALLATION OF BATT/BLANKET INSULATION:**

Install batt/blanket insulation throughout the building, as indicated on plans and sections, meeting required R-values and thickness, including number of layers indicated.

Install fire safing insulation at the top of all concrete masonry units, terminating at the underside of deck into miscellaneous voids, pipe, duct penetrations, etc. and where

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

otherwise indicated. Compact loose fire safing insulation to approximately 40% of normal maximum volume.

**PROTECTION:**

General: Protect installed insulation from harmful weather exposures and from possible physical abuses, where possible by nondelayed installation of concealing work or, where that is not possible, by temporary covering or enclosure.

**INSTALLATION OF VAPOR RETARDERS:**

General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage systems as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those which have been stuffed with loose fiber type insulation.

Seal vertical joints in vapor retarders, over framing by lapping not less than 2 framing members. Fasten vapor retarders to framing as recommended by manufacturer for type of framing, end and bottom edges, at perimeter of wall openings and at lap joints.

Seal overlapping joints in vapor retarders with adhesives per vapor retarder manufacturer's printed directions. Seal butt joints and fastener penetrations with tape recommended by vapor retarder manufacturer.

Seal joints caused by pipe, conduits, electrical boxes and similar items penetrating vapor retarder with cloth or aluminized type of type recommended by vapor retarder manufacturer to create an air-tight seal between penetrating objects and vapor retarder.

Repair any tears or punctures in vapor retarder immediately before concealment by other work. Cover with tape or another layer of vapor retarder.

**END OF SECTION 07200**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 07600-FLASHING AND SHEET METAL**

### **PART 1-GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

#### **DESCRIPTION OF WORK:**

Extent of each type of flashing and sheet metal work is indicated on drawings and by provisions of this section.

Types of work specified in this section include the following:

- Metal counter flashing; and base flashing.
- Metal wall flashing and expansion joint.
- Exposed pre-finished metal trim/fascia units
- Pre-finished aluminum gutters and RWL's.
- Miscellaneous sheet metal accessories.

Roofing accessories which are installed integral with roofing membrane are specified in roofing system sections as roofing work.

#### **SUBMITTALS:**

**Product Data;** Flashing, Sheet Metal, Accessories: Submit manufacturer's product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

**Samples;** Flashing, Sheet Metal, Accessories: Submit formed and fabricated samples of; Gutter, brackets, down spouts and RWL's, each type of wall flashing and cap flashings step flashings and other miscellaneous flashing materials.

**Shop Drawings;** Flashing, Sheet Metal, Accessories: Submit shop drawings showing layout, joining, profiles, and anchorage's of fabricated work, including major counter-flashings, trim/fascia units, gutters, down spouts, scuppers and expansion joint systems; layouts at 1/4" scale, details at 3" scale.

#### **JOB CONDITIONS:**

Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **PART 2 – PRODUCTS**

### **FLASHING AND SHEET METAL MATERIALS:**

**Exposed Sheet Metal Flashing/Trim:Copper:** ASTM B 370, cold-rolled except where soft temper is required for forming; 16 oz. (0.0216" thick) and 20 oz. (.0270" thick) except as otherwise indicated. Where copper is indicated as Lead Coated Copper, provide 0.06 lbs. per sq. ft. on exposed copper faces.

Miscellaneous Materials and Accessories:

**Solder:** For use with steel or copper, provide 50 - 50 tin/lead solder (ASTM B 32), with rosin flux.

**Fasteners:** Same metal as flashing/sheet metal or, other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

**Bituminous Coating:** Solvent type bituminous mastic, normally free of sulfur, compounded for 15-mil dry film thickness per coat.

**Sealant:** One part polyurethane based, type 2 (non-sag), Class A.

**Epoxy Seam Sealer:** 2-part non-corrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints including riveted joints.

**Adhesives:** Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.

**Paper Slip Sheet:** 5-lb. rosin-sized building paper.

**Metal Accessories:** Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gage required for performance.

**Elastic Flashing Filler:** Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**FABRICATED UNITS:**

**General Metal Fabrication:** Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual", "Copper and Common Sense" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true at line and levels indicated, with exposed edges folded back to form hems.

**Seams:** Fabricate non-moving seams in sheet metal with flat-lock seams. For metal other than pre-finished steel, tin edges to be seamed, form seams, and solder. Rivet joints for additional strength where required.

**Expansion Provisions:** Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of inter-meshing hooked flanges, not less than 1" deep, filled with mastic sealant (concealed within joints).

**Sealant Joints:** Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

**Separations:** Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

**Custom Fabricated Fascia, Trim, Soffiting and Gutter:**

Fabricated and provide a custom formed Pre-finished aluminum gutter, fascia, freeze and soffit, shaped and sized as indicated. Fabricated from 0.04" min. pre-finished aluminum, finished in Kynar 500 custom colors, selected by Architect, from full ranges of custom colors available from aluminum manufacture. Provide ability for all forms of thermal expansion and contraction in the fabrication and erections of scheduled units. All exposed fasteners are mandated to be color coated and matching finish of fabricated units.

Gutters are to receive Beehive type strainer at each down spout location.

**Counter Flashing and Reglets:**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Manufacturers:** Subject to compliance with requirements, provide products of the following:

Fry Reglet Corporation  
Keystone Flashing Company  
Cheney Flashing Company

Two piece flashing with snap type counter-flashing, for future removal and repair. Fitted into masonry or metal receiver as detailed. Refer to drawings for installation information.

### **PART 3 – EXECUTION**

#### **INSTALLATION REQUIREMENTS:**

**General:** Except as otherwise indicated, comply with manufacturer's installation Instruction's and recommendations, and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

**Underlayment:** Where pre-finished metal is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper.

Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6". Fabricate seams at joints between units with minimum 3" overlap, to form a continuous waterproof system

#### **CLEANING AND PROTECTION:**

Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finished.

**Protection:** Installer shall advise Contractor of required procedures for surveillance and protection of flashing and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

**END OF SECTION 07600**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT**

## **SECTION 07840 - FIRESTOPPING**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provision of Contract, including General and Supplementary Conditions and Division 1 - Specification section, apply to work of this section.

#### **DESCRIPTION OF WORK**

The extent and location of Firestopping is based on the levels of fire separation requirements shown on the Contract Documents.

#### **This Section includes:**

Through - penetrations firestopping in fire rated construction

Construction - gap firestopping of the same or different materials in fire rated construction.

Construction - gap firestopping occurring within fire rated wall, floor or floor - ceiling assemblies.

Construction - gap firestopping occurring at the top of fire-rated walls.

Through - penetration smoke - stopping in smoke partitions.

Construction -gap smoke-smoke in smoke partitions.

#### **REFERENCES:**

##### **Underwriters' laboratories**

Through - penetration firestop devices XHCR

Fire resistance ratings BXUV

Through-penetration firestop systems XHEZ

Fill all voids or cavity material XHHW

U.L. 1479 test method for fire test of through-penetration firestops, including optional air leak test.

U.L. component listing and test criteria.

Warnock Hersey

American Society for Testing and Material Standards ASTM

CIE/DIN age testing.

#### **DEFINITIONS:**

**Assembly:** Particular arrangement of materials specific to given type of construction detail in referenced documents.

**Barriers:** Time rated fire walls, smoke barrier walls, time rated ceiling / floor assemblies and structural floors.



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT**

Firestopping: Methods and materials apply in penetrations and unprotected openings to limit spread of heat, gasses and smoke.

Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.

Construction gaps: Gaps between top of wall and ceiling, and structural floors or roof decks; and gaps between adjacent sections of structural floors.

System: Specific products and applications classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.

Sleeve: Metal fabrication or pipe section extending through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

**SYSTEM DESCRIPTION:**

**Design requirements:**

Fire -rated construction: maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with others surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

Smoke barrier construction: maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration adsorption, and at other construction gaps.

**QUALITY CONTROL**

Deliver materials in their original, unopened containers bearing manufacturer's labels certifying contents.

Installer's qualifications: A firm experienced in installation or application of systems similar in complexity to those for this project, plus the following;

Acceptable to or licensed by the manufacturer, state or local authority where applicable.

At least 2 continuous years experienced with the indicated systems.

Successfully completed at least 5 comparable scale projects using systems indicated.

**SUBMITTALS**

**Product Data** in accordance with Section 01340

**Shop Drawings:** Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods,

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT**

hardware and installation procedures, plus the following specific requirements;

Details of each proposed assembly identifying intended products and applicable UL system number, UL classified device.

Manufacturer or manufacturer's representative shall provide engineering judgments and drawings relating to non-standard applications as needed.

Applicator's qualifications statement.  
List of past projects indicating required experience.

Provide local building and fire official copies of approved shop drawings and product materials data for their own use and review, prior to installation.

**Certificate:** Submit certificates from manufacturers of joint sealers attesting that their products comply with specification requirements and are suitable for use intended.

### **JOB CONDITIONS**

#### **Weather Conditions:**

Do not proceed with installation of firestopping under adverse weather conditions, or when temperatures are below manufacturer's recommended limitations.

#### **Delivery, Storage & Handling:**

Deliver materials to project site in original unopened containers with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, and curing time.

Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

Meet or exceed the minimum environmental conditions as recommended by the manufacturer for ventilation, masking, drop clothes, temperature and humidity conditions.

#### **GUARANTEE:**

Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance or general durability, or appearance to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be for one year from date of substantial completion as issued by the Architect / Engineer.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT**

## **PART 2 - PRODUCT**

### **Materials:**

#### **Through - penetrations firestopping of fire-rated construction:**

Systems or devices listed in the U.L. Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications, Systems or devices must be asbestos-free. Mortar systems must be Warnock Hersey approved.

Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device, and designed to perform this function.

### **Acceptable Manufacturer's and products:**

Those listed in the U.L. Fire Resistance Directory for the U.L. System involved or Mortar systems approved by Warnock Hersey.

All firestopping products must be from a single manufacturer. All trades shall use products from the same manufacturer.

#### **Construction-gap firestopping of fire - rated construction:**

Firestopping at construction gaps between edges of floor slabs and exterior wall construction.

Firestopping at construction gaps between tops of partitions and underside of structural systems.

Firestopping at construction gaps between tops of partitions and underside of ceiling or ceiling assembly.

Firestopping of control joints in fire rated masonry partitions.

Firestopping expansion joints.

Acceptable Manufacturer's and products - those listed in the U.L. Fire Resistance Directory for U.L. System involved.

### **Smoke-stopping partitions:**

Through-penetrations smoke-stopping: any system complying with the requirements for through-penetrations firestopping in fire-rated construction is acceptable provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

Construction smoke-stopping: Any system complying with the requirements for construction-gap firestopping in fire-rated construction is acceptable provided that the system includes the specified smoke seal or will provide a smoke seal. The length of

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT**

time of the fire resistance may be disregarded.

**ACCESSORIES:**

Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.

Forming materials: As classified under category XHKU in the U.L. Fire Resistance Directory.

**PART 3 - EXECUTION**

Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

Verify penetrations are properly sized and in suitable conditions for application of materials.

Do not proceed until all unsatisfactory conditions have been corrected. Prepare a written list of deficiencies found and notify the Architect / Engineer.

Commencement of work indicates acceptance of conditions and will become the full responsibility of the installer.

**PREPARATION:**

Clean surfaces to be in contact with penetrations seal materials of dirt, grease, oil, loose materials, rust or other substances that may affect proper fitting, adhesion or the required fire resistance.

**INSTALLATION**

Install penetration seal materials in accordance with printed instructions of the U.L. Fire Resistance Directory or Mortars per Warnock Hersey approval and in accordance with manufacturer's instruction.

Seal holes or voids made by penetrations to insure an effective smoke barrier.

Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, Install firestopping materials capable of supporting same loading as floor.

Protect materials from damage on surfaces subject to traffic.

Where large openings are created in wall or floors to permit installation of pipes, duct, cable tray, bus duct or other items, close unused portions of opening with firestopping materials tested for the application. See U.L. Fire resistance Directory or Warnock Hersey approvals.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT**

Install smoke stopping as specified for firestopping.

Where rated walls are constructed with horizontally continuous air space, double width masonry or double stud frame construction, provide vertical 12 inch wide fiber dams for full thickness and height of air cavity at maximum 15 foot intervals.

Hold an inspection with the manufacturer's representative prior to the closure of walls etc., and before notification to inspectors to verify that proper assemblies and methods are used.

**ADJUST and CLEANING:**

Clean up spills of liquid components.

Neatly cut and trim materials as required.

Remove equipment, materials and debris, leaving the area in undamaged, clean condition.

**END OF SECTION 07840**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT**

## **SECTION 07915 - SEALANTS, CAULKING & SEALS**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provision of Contract, including General and Supplementary Conditions and Division 1 - Specification section, apply to work of this section.

#### **DESCRIPTION OF WORK**

The extent and location of a joint sealer are shown on the drawings and specified herein, including the placement and installation of sealant material at new / existing construction, drywall installation, and in areas of water seals.

The required application of Joint / Sealers include, but are not necessarily limited to the following general locations;

##### **Interior:**

Joints between existing and new work  
Other joints indicated.

##### **Exterior:**

Between new and existing construction.  
Flashing  
Sill and Threshold.

#### **QUALITY CONTROL:**

Deliver materials in their original, unopened containers bearing manufacturer's labels certifying contents.

#### **SUBMITTALS:**

**Product Data:** in accordance with Section 01340.

**Sample:** submit manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available for each product exposed to view.

**Certificate:** Submit certificates from manufacturers of joint sealers attesting that their products comply with specification requirements and are suitable for intended use.

#### **JOB CONDITIONS:**

**Weather Conditions:** Do not proceed with installation of exterior sealant under adverse weather conditions, or when temperatures are below manufacturer's recommended limitations.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT**

**Delivery, Storage & Handling:**

Deliver materials to project site in original unopened containers with labels informing about manufacturer, product name and designation, color, expirations period for use, pot life, and curing time. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

**PART 2 - PRODUCT**

**GENERAL REQUIREMENTS**

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

**SEALANT TYPES AND USES**

**Exterior Sealants:**

Available Products: subject to compliance with requirements, products which may be incorporated in the work include;  
Dow Corning - 790 Silicone Building Sealant  
G.E. Silicone Construction Sealant - Silpur Weatherproofing Sealant  
Pecora Corporation - 890 Silicone Building Sealant

**Interior Sealants**

Available Products: Subject to compliance with requirements, products which may be incorporated in the work include:  
Pecora Corporation - AC-20 + Silicone  
Bostic Sealants - Chem-Caulk 600  
Dow Corning - 786 Silicone Sealant

**MISCELLANEOUS MATERIALS**

**Joint Cleaner:** Provide the type of joint cleaning compound recommended by the sealant manufacturer, for the joint surfaces to be cleaned.

**Joint Primer/Sealer:** Provide the type of joint primer/sealer recommended by sealant manufacturer, for the joint surfaces to be primed or sealed.

**Sealant Backer Rod:** Compressible rod stock polyethylene foam as recommended by sealant manufacturer. Provide size and shape of rod for joint indicated.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT**

**Bond Breaker Tape:** Self-adhering, polyethylene tape or other plastic tape recommended by sealant manufacturer.

### **PART 3 - EXECUTION**

#### **EXAMINATION:**

Examine joints indicated to receive joint sealers with installer present for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been correct.

#### **JOINT SURFACE PREPARATION**

Clean joint surfaces immediately before installation of sealant of substance detrimental to sealant bond.

**Cure Sealants** in accordance with manufacturer's instructions and recommendations.

#### **PROTECTION AND CLEANING**

Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they 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 sealers immediately and re-seal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

Clean off excess sealant or sealant smears adjacent to joints as work progresses by Methods, and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

**END OF SECTION 07915**



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 08110 - STEEL DOORS AND FRAMES**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification section, apply to work in this section.

#### **DESCRIPTION OF WORK**

**Extent** of steel doors and frames are indicated and scheduled on drawings, includes stock and custom fabricated doors and frames.

#### **QUALITY ASSURANCE:**

**Provide doors and frames** complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.

**Fire-rated Door Assemblies:** Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows" and have been tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.

#### **SUBMITTALS:**

**Product Data:** Submit manufacturer's technical product data substantiating that products comply with requirements.

**Shop Drawings:** Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items. All work shown at scale and detail sufficient to clearly indicate compliance to design and specification requirements.

Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings. Indicate coordination of glazing frames and stops with glass and glazing requirements.

#### **Field measure all existing wall thickness where new frames are scheduled.**

Submit schedule of existing conditions and amend frame dimensions as required to fit scheduled work.

**Label Construction Certification:** For door assemblies required to be fire-rated and

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

exceeding sizes of tested assemblies, submit manufacturer's certification for that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

**DELIVERY, STORAGE, AND HANDLING**

**Deliver** and inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

**Store** doors and frames at building site under cover. Place units on minimum 4" high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

**PART 2 - PRODUCTS:**

**ACCEPTABLE MANUFACTURERS:**

**Available Manufacturers:** Subject to compliance with requirements, manufacturers offering steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

Ceco Corp.  
Steelcraft/Div. American Standard Co.  
Republic  
Approved Equal:

**MATERIALS:**

**Hot-rolled Steel Sheets and Strip:** Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

**Cold Rolled Steel Sheets:** Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

**Galvanized Steel Sheets:** Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G 90 min. zinc coating, mill phosphatized.

**Supports and Anchors:** Fabricate of not less than 18 gauge galvanized steel sheet.

**Inserts, bolts, and Fasteners:** Manufacturer's standard units, except hot-dip galvanized items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable. Shop Applied Paint.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Primer:** Rust-inhibitive enamel or paint, either air drying or baking, suitable as a base for specified finish paints.

**FABRICATION, GENERAL:**

**Fabricate steel door** and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant.

Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with SDI-100 requirements as follows:

**Exterior Doors:** SDI-100, Grade III, extra heavy-duty, Model 2, minimum 16 gauge faces.

**Interior Doors:** SDI-100, Grade II, heavy-duty, Model 1, Minimum 16 - gauge faces.

**Fabricate exposed faces** of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel.

**Fabricate frames,** concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel (at fabricator's option.)

**Fabricate exterior doors,** panels and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16 gauge inverted steel channels, unless otherwise indicated by detail.

**Exposed Fasteners:** Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

**Thermal-Rated (Insulating) Assemblies:** At exterior locations and elsewhere as shown and or scheduled, provide doors which have been fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236. Unless otherwise indicated, provide thermal-rated assemblies with U factor of 0.067 / R-value of 14.97 BTU/ (hr. ft. 2 degree F) or better.

**Finish Hardware Preparation:** Prepare doors and frames to receive finish hardware in accordance with final approved Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.

**Reinforce doors and frames** to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Locate finish hardware** as indicated on final shop drawings, or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware" published by Door and Hardware and Hardware Institute.

**Shop Painting:**

**Clean, treat, and paint** exposed surfaces of steel door and frame units, including galvanized surfaces.

**Clean steel surfaces** of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.

**Apply shop coat** of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

**STANDARD STEEL DOORS:**

**Provide metal doors** of types and styles indicated on drawings or schedules.

**STANDARD STEEL FRAMES:**

**Provide metal frames** for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate exterior frames of minimum 14-gauge steel

**Fabricate frames** with mitered and welded corners. Hot dip galvanize all exterior frames after fabrication.

**Door Silencers:** Except on weather-stripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames.

**Plaster Guards:** Provide 26-gauge steel plaster guards or mortar boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and installation, and to close of interior of openings.

**PART 3 - EXECUTION**

**INSTALLATION:**

**General:** Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

**Placing Frames:** Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Frames locate In Existing Construction:** located at in-place concrete or metal wall installations, place frames to fit construction of enclosing wall conditions. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

**At in-place concrete or masonry** construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.

**Install fire-rate frames** in accordance with NFPA Std. No. 80.

**Door Installation:**

**Fit hollow metal doors** accurately in frames, within clearances specified in SDI-100. Fitting clearances for non-rated doors; provide 1/8" at jambs and heads, 1/16" per leaf at meeting stiles for pairs of doors, and 1/4" from bottom of door to top of decorative floor finish or covering, but in no case more than 3/4" from top of substrata. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.

**Place fire-rated doors** with clearances as specified in NFPA Standard No. 80, for type and location of scheduled door and frame.

**ADJUST AND CLEAN:**

**Prime Coat Touch-up:** Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

**Final Adjustments:** Check and readjust and clean operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

**END OF SECTION 08110**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 08200 - WOOD DOORS**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification section, apply to work in this section.

#### **DESCRIPTION OF WORK**

**Extent** of wood doors are indicated and scheduled on drawings, includes stock and custom fabricated doors and openings.

**Types** of wood doors required include but are not necessarily limited to the following:

Solid core flush wood doors with wood veneer faces in 20 min. ratings  
minimum door assembly.

Mineral Core Flush wood doors with wood veneer faces meeting the ratings  
indicated in the schedule.

**Factory-premachining** for hardware to be installed in field and as specified in approved hardware schedule.

#### **QUALITY ASSURANCE:**

**Provide doors and lights** complying with the following standards:

**AWI Quality Standard:** "Architectural Woodwork Quality Standards" including Section 1300 "Architectural Flush Doors" of the Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDA Quality Standards.

**Fire-rated Door Assemblies:** Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows" and have been tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies", "NFPA E 152 Fire Test of Door Assemblies", & "UL 10B Fire Test of Door Assemblies", by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.

#### **SUBMITTALS:**

**Product Data:** Submit manufacturer's technical product data substantiating that products comply with requirements.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Shop Drawings:** Submit for fabrication and installation of wood doors and hardware. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements. All work shown at scale and detail sufficient to clearly indicate compliance to design and specification requirements.

Provide schedule of doors using same reference numbers for details and openings as those on contract drawings. Indicate coordination of glazing frames and stops with glass and glazing requirements.

Field measures all existing frame thickness where new doors are scheduled. Submit schedule of existing conditions and amend frame dimensions as required to fit scheduled work.

**Samples:** Submit samples, 1'-0" square for the following, finished in Architect's selected color and finish.

**Doors for Transparent Finish:** Door faces with matching solid wood edging representing typical range of color and grain for each species of veneer and solid lumber required.

**Label Construction Certification:** For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, submit manufacturer's certification for that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

**WARRANTY:**

**General:** Warranties shall be in addition to, and not a limitation of other rights the Owner may have under the Contract Documents.

**Door Manufacturer's Warranty:** Submit written agreement on manufacture's standard form signed by manufacturer, Installer and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.

**Solid Core Interior Doors:** Life of installation.

**Contractor's Responsibilities:** Replace or refinish doors where contractor's work contributed to rejection or to voiding of manufacturer's warranty.

**DELIVERY, STORAGE, AND HANDLING**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Deliver** inspect wood doors upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

**Store** doors in the building (moisture controlled and heated) under cover. Place units on minimum 4" high wood blocking stacked vertically. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

## **PART 2 - PRODUCTS:**

### **ACCEPTABLE MANUFACTURERS:**

**Available Manufacturers:** Subject to compliance with requirements, manufacturers offering steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

Weyerhaeuser Company.  
VT Industries  
Approved Equal:

### **INTERIOR FLUSH WOOD DOORS:**

**Solid Core Doors with Wood Veneer Faces:**

**Faces:** Red Oak, Quarter Sawn

**AWI Grade:** Premium

**Construction:** 20 min. rating - SLC 5 (minimum rating indicated or not)  
45 min. and better, Fire rated cores based on approved tested assemblies meeting the indicated rating and hardware requirements.

**Adhesive:** Type I for Exterior and Type II for interior doors under normal conditions.

**Faces and AWI Grades:** Provide faces and grade to match non-rated doors in same area of building, unless otherwise indicated.

**Construction:** Manufacturer's standard core construction as required to provide fire-resistance ratings indicated.

**Edge Construction:** Provide manufacture's standard laminated edge construction for improved screw-holding capability and split resistance as compared to edges composed of single layer of treated lumber.



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Pairs: Provide fire-rated pairs with fire-retardant stiles which are labeled and listed for kinds of application indicated without formed steel edges and astragals.

Review hardware requirements for each door, where hardware requirements could affect the warranty of the door due to cutouts, or other openings, provide additional blocking. Provide additional blocking for

Closures  
Lock – Latch sets

**LIGHT FRAMES:**

Wood Beads for Light Openings in Fire Rated Doors: Manufacturer's standard fire rated wood-veneer beads in matching veneer species of door faces for doors of 20 min. or less. In 45 min. or more rated doors trim openings with UL approved metal frames, providing all required anchors, fire stops and accessories to meet requirements for rated assembly.

**FABRICATION:**

Fabricate non-rated doors in accordance with AWI Quality standards.

Fabricate fire-rated doors in accordance with AWI Quality Standards and to UL or Warnock-Hersey requirements. Attach fire rating label to door.

Provide lock blocks at lock edge, top of door for closure and other locations to meet hardware requirements.

Factory machine doors for scheduled finished hardware in full accordance with hardware requirements and dimensions. Do not machine for surface hardware.

Factory pre-fit doors for frame openings and dimensions identified on shop drawings and schedules

Fabricate to AWI Premium standards.

Shop glaze doors using interior methods as prescribed by door manufacturer to full fill warranty requirements.

**Finish Hardware Preparation:** Prepare doors to receive finish hardware in accordance with final approved Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.

**Contractor/Fabrication Note:**

**Locate finish hardware** as indicated on final shop drawings, or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware" published by Door and Hardware and Hardware Institute.

**PART 3 - EXECUTION**

**INSTALLATION:**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**General:** Install standard wood doors, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

**Install fire-rate frames** in accordance with NFPA Std. No. 80.

**Door Installation:**

**Fit wood doors** accurately in frames, within clearances specified in specified standards. Fitting clearances for non-rated doors; provide 1/8" at jambs and heads, 1/16" per leaf at meeting stiles for pairs of doors, and 1/4" from bottom of door to top of decorative floor finish or covering, but in no case more than 3/4" from top of substrata. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.

**Pilot drill all screw and bolt holes.**

**Place fire-rated doors** with clearances as specified in NFPA Standard No. 80 & UL for type and location of scheduled door and frame.

Install work in accordance with AWI Premium Quality Standards.

Set and secure materials and components in place, plumb and level.

Trim non-rated doors width by cutting equally on both edges.

Coordinate installation of doors, frames, glass and glazing, louvers and accessories.

Conform to AWI Standards and Test for warp and telegraphing.

**Seal top and bottom of wood doors and all openings made to door assembly prior to installation of hardware.**

**ADJUST AND CLEAN:**

**Final Adjustments:** Check and readjust and clean operating finish hardware items, verify that doors close as designed, with all required hardware installed, and all required clearances, leaving wood doors in frames undamaged and in complete and proper operating condition.

**END OF SECTION 08200**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 08310 - ACCESS DOORS**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification section, apply to work in this section.

#### **DESCRIPTION OF WORK**

**Extent**, Provide access doors to location where equipment is to be reached for repair, maintenance or adjustments, through finished walls, floors, and ceilings not readily accessible by other means. No access door shall be less than 8" x 8" square. Access doors to be sized based on required access with tools and equipment.

Types of access doors required include the following:

Access to controls or equipment located behind hard ceilings and walls, in floors.

Mechanical / Electrical equipment located hard ceilings, and walls or in floors.

Access to equipment and controls behind masonry walls / partitions.

#### **QUALITY ASSURANCE:**

**Fire-Resistance Ratings**: Wherever a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge and latch from manufacturer listed in Underwriters Laboratories, Inc. "Building Materials Directory" for rating shown.

**Provide UL label** on each fire-rated access door.

**Size Variations**: Obtain Architect's acceptance in writing of manufacturer's standard size units which may vary slightly from sizes indicated.

**Coordination**: Furnish inserts and anchoring devices which must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

#### **SUBMITTALS:**

**Product Data**: Submit manufacturer's technical product data substantiating that products comply with requirements.

**Shop Drawings**: Submit for fabrication and installation of access doors and hardware. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements. All work shown at scale and detail sufficient to clearly indicate compliance to design and specification requirements.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Verification:** Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.

## **PART 2 - PRODUCTS:**

### **ACCEPTABLE MANUFACTURERS:**

**Available Manufacturers:** Subject to compliance with requirements, manufacturers offering access doors and frames which may be incorporated in the work include; but are not limited to, the following:

J.L. Industries  
Karp Associates, Inc.  
Milcor Div. Inryco, Inc.  
Precision Ladders, L.L.C  
Approved Equal:

### **MATERIALS AND FABRICATIONS:**

**General:** Furnish each access door assembly manufactured as an integral unit, complete with all parts and ready for installation.

**Steel Access Doors and Frames:** Fabricate units of continuous welded steel construction, unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown or required, based on construction conditions.

**Frames:** Fabricate from 16 gauge steel.

**For Gypsum Board:** drywall furnish frames with drywalls bead.

**Flush Panel Doors:** Fabricate from not less than 14-gauge sheet steel, with concealed spring hinges of concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory applied prime finish.

**For Fire - Rated Units:** Provide manufacturer's standard insulated flush panel / doors, with continuous piano hinge and self-closing mechanism.

**Locking Device:** Furnish flush, screwdriver - operated cam locks of number required to hold door in flush, smooth plane when closed.

## **PART 3 - EXECUTION**

### **INSTALLATION:**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Comply with manufacturer's instructions for installation of access doors, to meet wall / floor / ceiling materials and ratings.

Contact and Coordinate installation the trade's personnel and verify correct location, size and operations, with work of other trades.

Set - Frames accurately in positions and securely attach to supports with face panels plumb or level in relations to adjacent finish surfaces.

**ADJUST AND CLEAN:**

Adjust hardware and panels after installation for proper operation.

Remove and Replace panels or frames which are warped, bowed or otherwise damaged.

**END OF SECTION 08310**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 08360 - UPWARD ACTING SECTIONAL DOORS**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS**

Drawings and general provisions of the Contract, including General Supplementary Conditions and other Division 1 Specification sections, apply to work of this section

#### **DESCRIPTION OF WORK**

Extent, location and size of each type of upward acting sectional door required are to be field reviewed and determined prior to commencement of requirements.

Types of upward acting sectional doors required include the following:

- Manufactures of standard section pre-finished sectional door, track and operators.
- New electric door opener and control equipment
- New weather-stripping and door seals following manufacture standard materials and details.

#### **SUBMITTALS:**

**Product Data:** Submit manufacturer's product data, installation instructions and general recommendations for each type of door, track, operator, hardware and safety device scheduled.

**Shop Drawings:** Manufacturer's standard line of Overhead Sectional Doors. Submit shop drawings showing layout, sizes, profiles, and anchorage's of work; layouts at 1/4" scale, details at 3" scale. Details shall show all pertinent information for each type of installation in both types of construction.

**JOB CONDITIONS:** Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes

#### **Delivery, Storage and Handling:**

Deliver upward acting sectional doors, tracks, equipment etc., in unopened packages, clearly identifying type, size, and other pertinent data. Inspect all components prior to storage and again prior to installation for damage. Reject any materials which indicate damage. Stack, place, store and protect components prior to usage under cover, unless interior storage is available.

**Warranty:** Provide manufacturers 1 year limited warranty on panel construction and one year warranty on workmanship and materials, all commencing from date of substantial completion.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **PART 2 - PRODUCTS**

### **MANUFACTURERS:**

**Note:** Drawings and Specification are based on one manufacturer's Standard upward acting sectional door, track, operators, equipment and safety features, Overhead Door Company. Another standard upward acting sectional door of similar and equivalent nature may be acceptable when the differences do not materially detract from the design, operation and safety features or intended performance as judge solely by the Architect / Engineer.

### **MATERIALS AND FABRICATION:**

**General:** Furnish each door assembly manufactured as an integral unit, complete with all parts and ready for installation

Overhead Door Corporation – Thermacore Model 592 Extra Heavy Duty 2" thickness, CFC-free and HCFC-free polyurethane fully encapsulated, laminated to inside and outside sheets of steel, providing a R value of 17.5 and U = .057".

The outside skin shall be hot dipped galvanized steel no less than .016" thick embossed with a stucco pattern and finished with a two coat paint system. Inside skin shall be pre-painted galvanized steel no less than .015" thick. End Stiles of 16 gauge with thermal break.

Air Infiltration design 0.08 cfm at 15 mph; cfm 0.08 at 25 mph.

Wind load Design; ANSI/DASMA 102 Standards and as required by code.

Acrylic glazing in pattern indicated.

Section design includes a thermal break, preventing heat and cold conductivity. Bottom of door is to be weather-stripped in a EPDM bulb type. Header and jamb weather-stripping to be manufacturer's standard design.

Hardware (All garage type doors): Galvanized steel hinges and fixtures, Ball bearing rollers with harden steel races. No Internal / external locking, Electric side mounted door (Jackshaft, Side Mount –Heavy-Duty, min. ½ HP, Single Phase ) operator, Entrapment protection with Photo electric sensors. Vehicle detector operation, for exterior operations and operator control station (open, close & stop). Track per manufactures. All hinges and roller brackets to be heavy duty galvanized steel. Rollers to have ball bearings with hardened races. Galvanized aircraft type lift cable to have a minimum 7:1 safety factor. Counterbalance assembly shall consist of torsion springs mounted on a continuous shaft, oil tempered steel spring with for a springs, recommendations for door size and usage.

Lift Clearance Track – Parallel to roof slope (refer to each doors and surrounding roof relationship), manufacturer's standard 2" track and support accessories.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Heavy gauge galvanized steel track. Track shall be bracket mounted for wood or clip style continuous reverse angle mounted with track adjustment to allow compression of top and jamb seals. Vertical track shall be tapered for weather tight closure. All reinforcing angle and mounting brackets to be welded to track, except where adjustable.

Provide limit stops at top of door travel to reduce impact loads to upper portions of lift track.

### **PART 3 – EXECUTION INSTALLATION REQUIREMENTS:**

**General:** Comply with manufacturer's instruction for protection, handling and installation of upward acting sectional doors, tracks, operators and safety equipment.

Carefully check all components for damage prior to beginning installation. Commencement of installation procedures indicates acceptance of all equipment, components etc., as being in warrantable condition and in working order. Field verify all required dimensions, clearances, substrates and anchoring.

Install doors, tracks, operators and safety equipment in strict compliance to manufacturers. Verify that all clearances, alignments, and operational requirements are complied with and door, hardware operates in accordance with manufacturers guidelines.

Once installed operator's equipment to insure smooth, proper operations and safety equipment, adjust as required.

**CLEANING AND PROTECTION:** Clean exposed surfaces, removing substances which might cause deterioration of finish or interference with operation.

**Protection:** Installer shall advise Contractor of required procedures for surveillance and protection of work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

**END OF SECTION 08630**



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 08710 -FINISH HARDWARE**

### **PART 1 -GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

#### **DESCRIPTION OF WORK:**

**Definition:** "Finish Hardware" includes items known commercially as finish hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.

**Extent** of finish hardware required is indicated on drawings and in schedules. The General Contractor shall include in this base bid Section 08710, Finish Hardware.

**Types** of finish hardware required include the following:

- Hinges
- Lock cylinders and keys
- Lock and latch sets
- Bolts
- Exit-devices
- Closers
- Mag Hold Opens
- Miscellaneous door control devices
- Door trim units
- Protection (Kick) plates
- Weather-stripping for exterior doors
- Thresholds

**Silencers** included integral with hollow metal frames are specified with door frames elsewhere in Division 8.

#### **QUALITY ASSURANCE:**

**Manufacturer:** Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Supplier:** A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of no less than 2 years, and who is, or who employs an experienced architectural hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.

**Fire-Rated Openings:** Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware which has been tested and listed by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels.

Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".

**SUBMITTALS:**

**Product Data:** Submit manufacturer's technical product data for each item of hardware in accordance with Division-1 section "Submittals". Include whatever information may be necessary to show compliance with requirements, **and include instructions for installation and for maintenance of operating parts and finish.**

**Hardware Schedule:** Submit final hardware schedule in manner indicated below. Coordinate hardware with door, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.

**Final Hardware Schedule Content:** Based on finish hardware schedule, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening referenced to the scheduled door number. Include the following information:

- Type, style, function, size and finish of each hardware item.
- Name and manufacturer of each item.
- Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
- Explanation of all abbreviations, symbols, codes, etc., contained in schedule.
- Mounting locations for hardware.
- Door and frame sizes and materials.
- Keying information.

**Submittal Sequence:** Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.

**Keying Schedule:** Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled. Keying to be based on grandmaster, master, standard keying system, matching existing keying system.

**Templates:** Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

### **PRODUCT HANDLING:**

**Tag each** item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.

**Deliver** individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

**Provide secure lock-up** for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

## **PART 2 -PRODUCTS**

### **SCHEDULED HARDWARE:**

**Requirements** for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware is specified herein. Products are identified by using ANSI/BHMA hardware designation numbers where applicable. Provide products complying with these standards and requirements specified elsewhere in this section.

### **MATERIALS AND FABRICATION:**

#### **General:**

**Hand of door:** Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

**Base Metals:** Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

**Fasteners:** Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

**Furnish screws** for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

**Provide concealed fasteners** for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.

**Tools and Maintenance Instructions for Maintenance:** Furnish a complete set of specialized tools and maintenance instructions as needed for owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

**HINGES, BUTTS AND PIVOTS:**

**Templates:** Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template produced units.

**Screws:** Furnish Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.

**Hinge Pins:** Except as otherwise indicated, provide hinge pins as follows:

**Steel Hinges:** Steel pins.

**Exterior Doors:** Non-removable pins.

**Out-swing Corridor Doors:** Non-removable pins.

**Interior Doors:** Non-rising pins.

**Tips:** Flat button and matching plug, finished to match leaves.

**Number of hinges:** Provide not less than 3 hinges per door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.

**Refer to Hardware Schedule on Drawing.**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**KEYING:**

**General:** Supplier will meet with Owner to finalize keying requirements and obtain final instructions in writing.

**Comply with Owner's instructions** for master-keying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

**Permanently inscribe** each key with number or lock that identifies cylinder manufacturer key symbol, and notation '**DO NOT DUPLICATE**'.

**Key Material:** Provide keys of nickel silver only.

**Key Quantity:** Furnish 3 change keys for each lock; 5 master keys for each master system; and 5 grandmaster keys for each grandmaster system.

**Provide an indexed key control system** in accordance with BHMA 5011971 including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet E8341, all as recommended by system manufacturer, with capacity for 150% of the number of locks required for the project.

**LOCK CYLINDERS:**

**General:** Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver. Cylinder face shall match finish specified for the hardware in which it is to be installed.

Furnish temporary inserts for the construction period and remove these when directed.

**Type A Keying:** Where so scheduled, provide 6-pin tumbler cylinder, with construction master key feature.

**LOCKS, LATCHES:**

**Strikes:** Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.

**Provide dustproof** strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.

**Provide roller type strikes** where recommended by manufacturer of the latch and lock units.

**Lock Throw:** Provide 5/8" minimum throw of latch and deadbolt used on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Provide 1/2" minimum throw on other latch and deadlock bolts.

**Lockset, Latch-set and Exit Device Trim:** Provide manufacturer's standard escutcheon plate 2- 1/2 - 3" wide of sufficient length to span the lock case or to be through bolted. **Provide lever handle- 5 1/2" long**, not-less-than 5/8" diameter similar to the following:

Corbin Russwin - Series  
Sargent - Series

Finish on escutcheon plate and lever handle shall be as specified. Groove the back of all lever handles and knobs scheduled to be installed on doors to hazardous areas, i.e.. storage rooms, mechanical rooms, closets, etc., and where otherwise specified. Provide a tactile warning surface complying with ANSI 4.27.3, 117.1-1986 and UFAS 4.29.3 (knurling of surface).

### **LOCKSETS:**

**Refer to Hardware Schedule on Drawing.**

### **LATCHSETS:**

**Refer to Hardware Schedule on Drawing.**

### **EXIT DEVICES:**

**Refer to Hardware Schedule on Drawing.**

### **DOOR CLOSERS**

**Size of units:** Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon the size of door, exposure to weather and, anticipated frequency of use. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.

**Access-Free Manual Closers:** Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.

**Type: Refer to Hardware Schedule on Drawing.**

Provide the following options on all door closers:

1. Fully adjustable closing force.
2. Fully adjustable back-check.
3. Adjustable, two-speed closing control.

### **DOOR TRIM UNITS:**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Fasteners:** Provide manufacturer's standard exposed fasteners for door trim units (kick plates and similar units); either machine screws or self -tapping screw. Finish screw heads to match finish of item being attached.

**Fabricate Protection plates** (armor, kick or mop) not more than 1 1/2" less than door width on stop side and not more than 1/2" less than door width on pull side, x the height indicated.

**PROTECTION PLATES:**

**Type:** **Refer to Hardware Schedule on Drawing.**

**WEATHER-STRIPPING:**

**General:** Except as otherwise indicated, provide continuous weather-stripping at each edge of every exterior door leaf. Provide type, and sizes scheduled. Provide non-corrosive fasteners as recommended by manufacturer for application indicated.

**Replaceable Seal Strips:** Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

**WEATHER-STRIPPING SET:**

Provide the following set of weather-stripping for doors so scheduled. Provide items equal to the following:

**Refer to Hardware Schedule on Drawing.**

**HOLD OPENS, MAGNETIC:**

**Type A:** ANSI A156.4-1972, C00021, wall mounted single unit for swinging doors.

**BUMPERS:**

**Refer to Hardware Schedule on Drawing.**

**THRESHOLDS:**

**Refer to Hardware Schedule on Drawing.**

**HARDWARE FINISHES:**

**Provide matching finishes** for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

**Provide finishes which match** those established by BHMA or, if none established, match the Architect's sample.

**Provide quality of finish**, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.

**Provide protective lacquer coating** on all exposed hardware finishes of brass, bronze and aluminum, except as otherwise indicated.

**PART 3 - EXECUTION**

**INSTALLATION:**

**Mount hardware units** at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

**Install each hardware item** in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

**Set units level**, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

**Drill and countersink** units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

**Set thresholds** for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

**ADJUST AND CLEAN:**

**Adjust and check** each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Clean adjacent surfaces** soiled by hardware installation.

**Final Adjustment:** Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating' equipment.

**Instruct Owner's Personnel** in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

**Finish Hardware Schedule –**  
**Refer to Hardware Schedule on Drawing.**

**END OF SECTION 08710**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 08800 - GLASS AND GLAZING**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provision of Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to work of this section.

#### **DESCRIPTION OF WORK:**

Extent of Glass and Glazing work for fixed glass units (other than manufactured windows) is indicated on drawings and schedules.

Further specified herein and include glass for:

Doors and windows not indicated as "Pre-glazed".

#### **SYSTEM DESCRIPTION:**

Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loose or breakage of glass, failure of sealant or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.

Normal thermal movement is defined as that resulting from an ambient temperature range of 120 degrees F. and from a consequent temperature range within glass and glass framing members of 180 degrees F.

Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

Deterioration of coated glass is defined as the development of manufacturing defects including peeling, cracking or other indications of deterioration in metallic coating due to normal conditions of use

#### **SUBMITTALS:**

**Product Data:** Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions.

**Samples:** Submit, for verification purposes, 12" square samples of each type of glass indicated except for clear single pane units and 12" long samples of each color required for each type of sealant or gasket exposed to view. Install sealant or gasket sample

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

between two strips of material representative of adjoining framing system in color.

**Certificate:** submit certificates from respective manufacturers attesting that glass and glazing materials furnished for project comply with requirements.

Separate certification will not be required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.

**Compatibility and Adhesion Test Report:** Submit statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealant and interpreting test results relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion.

**QUALITY ASSURANCE:**

**Glazing Standards:** Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated, Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.

**Safety Glazing Standard:** Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 testing requirements of 16 CFR Part 1201 for category II materials.

Each light of safety glazing material installed shall be permanently labeled on the safety glazing material. The label shall identify the labeler, whether manufacturer, fabricator or installer, and the nominal thickness and the type of safety glazing material and the fact that said material meets the test requirements of the American National Standards Institute Standard ANSI Z-97, 1-1971. Such label shall be legible and visible after installation.

**Fire Resistance Rated Wire Glass:** Provide wire glass products that are identical to those tested per ASTM E 163 (UL 9) and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

**Insulating Glass Certification Program:** Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of inspecting and testing organization indicated below:

Insulating Glass Certification Council (IGCC)  
Associated Laboratories, Inc. (ALI)

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

**DELIVERY, STORAGE, AND HANDLING:**

Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

**PROJECT CONDITIONS:**

Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation, or other causes.

Install liquid sealant at ambient and substrate temperatures above 40 deg. F.

**WARRANTY**

General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure or hermetic seal of air space (beyond that due to glass breakage) as evidences by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, and other visual indications of seal failure or performance, provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.

Warranty Period: Manufacturer's standard but not less than 10 years after date of substantial completion certificate issued by Architect.

**PART 2 - PRODUCTS**

**MANUFACTURERS:**

Available Manufacturers: Subject to compliance with requirements manufacturers offering products which may be incorporated in the work include but are not limited to,

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

the following:

Guardian Industries, Inc.  
LOF Glass, Inc.  
PPG Industries, Inc.

**GLASS PRODUCTS, GENERAL:**

Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class quality , and if applicable , form finish, mesh and pattern.

Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable form, finish, and pattern.

Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thickness indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

**PRIMARY GLASS PRODUCTS:**

Type A; Clear Float Glass: Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), 1/4" thick unless noted otherwise.

Type B: Wired Glass: Type II (patterned and wired glass, flat), Class 1 (clear), Quality q3 (select glazing) Form 1 (wired polished both sides), Mesh m2 (square), 1/4" thick unless noted otherwise.

Type C; Tempered Safety Glass: Heat treated float glass, Condition A (uncoated), Type 1 (transparent glass, flat), Quality q3 (glazing select), Kind FT (fully tempered), 1/4" thick unless noted otherwise.

**INSULATING GLAZING ASSEMBLIES:**

General: Provide pre-assembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, and spacer material. corner design and desiccant.

For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this section applicable to types, classes, kinds and conditions of glass products indicated.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Provide heat-treated panes of kind and at locations indicated or, if not indicated, provide heat-strengthened panes where recommended by manufacturer for application indicated and tempered where indicated or where safety glass is designated or where safety glass is designated or required.

Performance Classification per ASTM E 774: Class A

|                                |   |
|--------------------------------|---|
| <u>Thickness of Each Pane:</u> | 1/4"  |
| <u>Air Space Thickness:</u>    | 1/2"  |
| <u>Sealing System:</u>         | Dual seal; primary sealant: polyisobutylene, secondary sealant; polysulfide.    |
| <u>Spacer Material:</u>        | Manufacturer's standard metal   |
| <u>Desiccant:</u>              | Manufacturer's standard; either molecular sieve or silica gel or blend of both. |
| <u>Corner Construction:</u>    | Manufacturer's standard corner construction.                                    |

Type D: Tempered Safety Insulating Glazing Assembly w/ Low Emmissivity-Coated Insulating Glass Unit: Manufacturer's standard units with one pane of glass coated with durable, neutral-colored, low Emmissivity metallic coating, of type and on surface indicated, and complying with the following requirements:

Interior Pane: Tempered Safety Glass, with low -e coating at side 3 of assembly.  
Exterior Pane: Tempered Safety Glass gray tinted.

Equal to: Guardian Sun-Guard LE-63: Gray, Visible Light; % transmittance 31,  
Solar Energy 25 %, Winter U-value 0.35 night time, Shading Coefficient 0.40.

PPG - Sungate: Gray, Visible Light; % transmittance 36, %, Total Solar  
Energy 23 %; Winter U-value 0.31 night time, Shading Coefficient 0.40.

Or Approved Equal

Type E: Heat Treated Insulating Glazing Assembly w/ Low Emmissivity-Coated Insulating Glass Unit: Manufacturer's standard units with one pane of glass coated with durable, neutral-colored, low Emmissivity metallic coating, of type and on surface indicated, and complying with the following requirements:

Interior Pane: Heat Treated, with low -e coating at side 3 of assembly.  
Exterior Pane: Heat Treated, gray tinted.

Equal to: Guardian Sun-Guard LE-63: Gray, Visible Light; % transmittance 31,  
Solar Energy 25 %, Winter U-value 0.35 night time, Shading Coefficient 0.40.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

PPG - Sungate: Gray, Visible Light; % transmittance 36, %, Total Solar Energy 23 %; Winter U-value 0.31 night time, Shading Coefficient 0.40.

Or Approved Equal

**ELASTOMERIC GLAZING SEALANTS AND PERFORMED GLAZING TAPES:**

General: Provide products of type indicated and complying with the following requirements:

Compatibility: Select glazing sealant and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealant and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.

ELASTOMERIC Sealant Standard: Provide manufacturer's standard chemically curing, ELASTOMERIC sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.

Colors: Provide color of expose sealant indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

Two-Part Polysulfide Glazing Sealant: Type M, Grade NS; Class 25: Use NT, M, G, A, and, as applicable to uses indicated, O.

Available Products: Subject to compliance with requirements, glazing sealant which may be incorporated in the work includes, but is not limited to, the following:

Two-Part Polysulfide Glazing Sealant:

"Chem-Calk 200"; Bostick Construction Products Div.  
"Synthacalk GC-5" ; Pecora Corp.

Performed Butyl-polysobutylene Glazing Tape With Space Rod:

"Chem-Tape 60"; Bostik Construction Products Div.  
"Shim-Seal"; Pecora Corp.  
"Pre-Shimmed Tremco 440 Tape"; Tremco, Inc.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**MISCELLANEOUS GLAZING MATERIALS:**

Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

Cleaners, Primers and Sealers: Type recommended by sealant manufacturer.

Setting Blocks: Neoprene or EPDM blocks as required for compatibility with glazing sealant, 80 to 90 Shore -A- durometer hardness.

Spacers: Neoprene or EPDM blocks as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

**PART 3 - EXECUTION:**

**EXAMINATION:**

Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corner; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected. Provide written report to Architect on findings and acceptable conditions.

**PREPARATION:**

Clean glazing channels and other framing member to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

**GLAZING, GENERAL:**

Comply with combined printed recommendations of glass manufacturers; of manufacturers of sealant and other glazing material, except where more stringent requirements are indicated, including those of referenced glazing standards.

Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thickness, with reasonable tolerances. Adjust as required by job conditions at time of installation.

Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

Apply primers to joint surfaces where required for adhesion of sealant, as determined by reconstruction sealant-substrate testing.

**GLAZING:**

Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.

Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width.

Set units of glass in each series with uniformity of pattern, draw bow and similar characteristics.

Force sealant into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

Tool exposed surfaces of sealant to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

**PROTECTION AND CLEANING:**

Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove non-permanent labels and clean surfaces.

Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer.

Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Wash glass on both faces not more than 4 days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Wash glass by method recommended by glass manufacturer.

**END OF SECTION 08800**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 09250 - GYPSUM DRYWALL**

### **PART I - GENERAL**

#### **RELATED DOCUMENTS**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division- 1 Specification section, apply to work of this section.

#### **DESCRIPTION OF WORK:**

Type of work includes:

Gypsum drywall including screw-type wood / metal support system.  
Interior gypsum drywall ceiling/soffits. impact resistant)  
Drywall finishing (joint tape-and-compound treatment).

#### **QUALITY ASSURANCE:**

Fire-Resistance Rating: Where gypsum drywall systems with fire-resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories acceptable to authorities having jurisdiction.

Single-Source Responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturer recommended by the prime manufacturer of gypsum boards.

#### **SUBMITTALS:**

Product Data Submit manufacturer's product specifications and installations instructions for each gypsum drywall and sheathing component, including other data as may be required to show compliance with these specifications.

#### **DELIVERY, STORAGE AND HANDLING:**

Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

Store materials inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum board flat to prevent sagging.

Handle Gypsum Board to prevent damage to edges, ends or surfaces. Protect metal corner beads and trim from being bent or damaged.

#### **PROJECT CONDITIONS:**

Environmental requirements, General: Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Cold Weather Protection: When ambient outdoor temperatures are below 55 degrees F, maintain continuous, uniform, comfortable building working temperatures of not less than 55 degrees F for a minimum period of 48 hours prior to, during and following application of gypsum board and joint treatment or bonding of adhesive.

Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after application. avoid drafts during dry, hot weather to prevent too rapid drying.

**PART 2 - PRODUCTS**

**ACCEPTABLE MANUFACTURERS:**

**Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

Metal Support Materials:

Dale Industries, Inc.

Gold Bond Building Products Div., National Gypsum Co.

United States Gypsum Co.

Direct Suspension Systems:

Chicago Metallic Corp.

Donn Corporation

United States Gypsum Co.

Gypsum Board and Related -Products American Gypsum Co.

Gold Bond Building Products Div., National Gypsum Co.

United States Gypsum Co.

National Gypsum Co.

**METAL SUPPORT MATERIAL.**

**Ceiling Support Materials and Systems:**

General: Size ceiling support components to comply with ASTM C 754 unless otherwise indicated.

Hanger Wire: ASTM A 641, soft, Class I, galvanized.

Hanger Anchorage Devices: Screws, clips, bolts, or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven through standard construction practices or by certified test data. Size devices for 3x calculated load supported.

Direct Suspension System. Manufacturer's standard zinc-coated steel system of furring runners, furring tees and accessories designed for concealed support of gypsum drywall ceilings; of proper type for use intended.

Support Materials:

**GYPSUM DRYWALL 09250      2**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Steel framing of size and spacing indicated on drawings, framing meeting ASTM C 645

Steel Rigid Furring Channels: ASTM C-645, C shaped, depth and minimum thickness base metal as follows: Depth: 1 1/2" unless otherwise indicated.

Resilient Channels: ASTM C 645 resilient channel furring 2 1/2" wide x 1/2" total height, base metal.

Z shaped Furring Channels ASTM C 645, Z shaped, depth and minimum thickness base metal as follows: Depth as indicated.

Control Joint ASTM C-645, V shaped, depth and minimum thickness base material, 1 3/4" wide x 1/2".

**Wall Partition Support Materials:**

Studs: refer to Cold Formed Metal Framing, zinc coated, sheet steel unless otherwise indicated. Provide studs with Knurled flange edges bent back 90 degrees (1 1/4" min.) and doubled over to form a min. 1/16" return.

Runners: Match studs type recommended by stud manufacturer for door and ceiling support of studs, and for vertical abutment of drywall work at other locations.

Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth and minimum thickness base metal as follows; Depth 7/8"x 2 3/4".

Deflection Track: Provide track at all locations where metal stud assemblies abut or attach to construction susceptible to deflection. Deflections requirements are to be established at max. of 1" unless otherwise noted. Deflection track shall be capable of meeting deflection requirements with 50 % of track left to retain stud.

V- Bracing: Provide bracing constructed of pressed steel channel (CR), designed to be fastened to studding or joist meeting at 1/3 length of span. Bracing strap to be a minimum of 10' length and 1/2" deep x 11/2" wide x 16 gauge in thickness, attached to adjacent metal studding with a minimum of 1 # 10 TEK screw and bridging angles.

Flat Strap Bracing: Provide bracing constructed of 20 gauge min. (FS), designed to be fastened to studding or joist at recommended spacing. Bracing strap to be properly anchored to studs and joist as recommended by stud manufacturer for locations and strength.

**GYPSUM BOARD:**

Gypsum Wallboard: ASTM C 36, of types, edge configuration and thickness indicated below, in minimum lengths available to minimize end-to-end butt joints.

**Typical wall and Ceiling Installations:**

Type: Type X Fire Code (F.C.) for fire-resistant rated assemblies and where indicated (for wall /ceiling assemblies)

Edges: Tapered

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Thickness: 5/8", regular unless otherwise indicated.

Size: Min. 4'-0" x 8'-0"

**In High Abuse Areas (Garage Area)**

Abuse Resistant Gypsum Board.

Type: Type X Fire Code-Equal to USG Fiberock Brand Panels Gypsum Board.

Style: Tapered Edges

Thickness: 5/8", unless otherwise indicated.

Size: Min. 4'-0" x 8'-0"

**At Typical Wet Areas (bathrooms, showers)-**

Water-Resistant Gypsum Board: ASTM C-63G (including F.C. at rated assemblies) and as follows:

Grade WR: Water - resistant treated core.

Style: Tapered edges

Thickness: 5/8" Unless otherwise noted.

Size: Min. 4'-0" x 8'-0"

**Substrate for where scheduled tile work:** (used as underlayment where-ever tile work is indicated)

Substrate: Durock- Cement Board

Style: Tapered edges

Thickness: 5/8" unless otherwise noted.

Style: Tapered Edges

Size: min. 4'-0" x 8'-0"

Include all required fasteners and interior tapes and adhesives.

**TRIM ACCESSORIES**

General- Provide manufacture's standard trim accessories of types indicated for drywall work normally expected for type of work, formed of galvanized steel, with either knurled and perforated flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide comer beads, L-type edge trim-beads, and one-piece control joint beads. Following recommendations from manufacturer and meeting required spaces.

**JOINT TREATMENT MATERIALS:**

General- ASTM C-475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.

Joint Tape Fiberglass drywall tape

Joint Compound: Ready-mixed taping compound for base and tape coat, & topping joint compound for finished coats.

Grade: 2 separate grades; one specifically for bedding tapes and filling depressions, and one for topping and sanding.

**MISCELLANEOUS MATERIALS:**

General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.

Gypsum Board Screws: Comply with ASTM C 646

Concealed Acoustical Sealant: Nondrying, non-hardening, non-skinning, non-staining, non-bleeding, gunnable sealant for concealed applications per ASTM C 919 at all interior partitions and space separations.

### **PART 3 - EXECUTION**

#### **PREPARATION FOR METAL SUPPORT SYSTEMS:**

Ceiling Anchorage's Coordinate work with structural ceiling work to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling hangers.

#### **INSTALLATION OF METAL SUPPORT SYSTEMS:**

Ceiling Support Suspension Systems:

Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or other anchorage devices or fasteners as indicated.

Space main runners: Space 1 1/2" main runners channels at 4'-0" o/c. and space hangers within 6" of wall. Erect metal furring channels at right angles to 1 1/2" carrying channels or main supports, spaced not to exceed 24" o/c, and within 6" of walls, except as otherwise shown. Provide a 1" clearance between furring ends and abutting walls.

Level main runners. to a tolerance of 1/4" in 12' - 0", measured both lengthwise on each runner and transversely between parallel runners.

Direct-hung Metal Support System Attach perimeter wall track or angle wherever support system meets vertical surfaces. Mechanically join support members to each other and butt-cut to fit into wall track.

Install auxiliary framing at termination of drywall work, and at openings for light fixtures and similar work, as required for support of both the drywall construction and other work indicated for support thereon.

Wall/Partition Support Systems:

Install supplementary framing blocking and bracing at termination's in the work and for support of fixtures, equipment serviced, heavy trim, grab bars, toilet accessories, furnishings, and similar work to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook" published by United States Gypsum Co..

Provide wood blocking for toilet partitions and accessories of pressure treated 2"x 10" members secured to studs with a minimum of 3 fasteners, capable of resisting 300 pounds.

Space studs 16" o/c., unless otherwise indicated.

**GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS.**

Applicator must examine areas and conditions under which drywall and framing work is to be applied and notify Contractor and Architect in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Architect.

Gypsum Board Application and Finishing Standards: ASTM C 840 and GA 216

Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 1' - 0" in alternate courses of board.

Install ceiling board in the direction and manner which will minimize the number of end butt joints, and which will avoid end joints in the central area of each ceiling. Staggered end joints at least 1' - 0".

Install wall partition boards vertically to avoid end-butt joints where possible, At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.

Install Exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.

Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edge abut, tapered edges against tapered edges and mill-cut or field-cut ends. Do not place edges against cut edges or ends. Stagger vertical joints over different studs on opposite side of partitions.

Attach Gypsum board to supplements framing and blocking provided for additional support at openings and cutouts.

Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.

Cover both faces of stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.

Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage.

Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4" to 1/2" space and trim edge with finish edge trim. Seal joints with acoustical sealant.

Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum board over wood framing, with "floating" internal corner construction.



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Space fasteners in gypsum board in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

**METHODS OF GYPSUM DRYWALL APPLICATION:**

**Single-Layer Application**

On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.

On partitions/walls apply gypsum board vertically in full length sheets unless otherwise indicated.

On Partitions/walls 8'- 1 " or more in height apply gypsum board horizontally (perpendicular); use maximum length sheets possible to minimize end joints.

Single Layer Fastening Methods Apply gypsum board to supports with screws.

**INSTALLATION OF DRYWALL TRIM ACCESSORIES:**

General: Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports.

Install metal corner beads at external corners of drywall work

Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide L type finish trim with face flange to receive joint compound.

Install metal corner control joint (beaded type) where indicated. If not indicated, install not more than 30' o/c.

**FINISHING OF DRYWALL**

General:- Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for decoration. Pre-fill open joints and rounded or beveled edges, if any, using type of compound recommended by manufacturer.

Apply joint tape (as recommended by manufacturer) at joints between gypsum board, except where trim accessories are indicated.

Apply joint compound in 3 coats (not including pre-fill of openings in base), and sand between last 2 coats and after last coat. Follow manufacturers requirements for product and materials based on substrate materials and requirements.

Levels of Finishing:

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Level 5 finishing following recommended levels of Gypsum Finish.

Partial Finishing: Omit third coat and sanding on concealed drywall work which is indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

**PROTECTION OF WORK:**

Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall work being without damage or deterioration at time of substantial completion,

**END OF SECTION 09250**

## **SECTION 09510 - ACOUSTICAL CEILING & SUSPENSION**

### **PART I - GENERAL**

#### **RELATED DOCUMENTS**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division- 1 Specification section, apply to work of this section.

#### **DESCRIPTION OF WORK:**

Extent of each type of acoustical ceiling is shown and schedule on drawings and specified herein.

Types of acoustical ceilings specified in this section include the following:

Acoustical Lay-in type ceiling panels and exposed grid suspension in pattern and size described in these specifications and indicated in the drawings.

#### **SUBMITTALS:**

**Product Data** Submit manufacturer's product specifications and installations instructions for each acoustical and suspension component, including other data as may be required to show compliance with these specifications.

**Samples:** Submit manufacture's standard size samples of acoustical units, but not less than 6" square, and of exposed ceiling suspension members including wall and special moldings. Provide samples showing full range of colors, textures and patterns available for each type of component indicated.

#### **QUALITY ASSURANCE:**

**Fire Performance Characteristics:** Provide acoustical ceiling components that are identical to those for the following fire performance characteristics, according to ASTM test method indicated by UL or other testing inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.

**Surface Burning:** As follows, tested per ASTM E 84

Flame spread: 25 or less

Smoke developed: 50 or less

**Coordination of work:** Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by, of penetrating through ceilings, including light fixtures, HVAC Equipment, and partition systems.

#### **DELIVERY, STORAGE AND HANDLING**

**Deliver materials** in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

**Store materials** inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

causes. Neatly stack acoustical components to afford the best level of protections from damage.

Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.

Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

**PROJECT CONDITIONS:**

Space Enclosures: Do not install interior acoustical ceilings until space is enclosed and weather proof, all wet work in space is completed and nominally dry, work above ceilings is complete, ambient conditions of temperature and humidity will be continuously maintained at values near those for final occupancy.

**EXTRA MATERIALS:**

Deliver extra materials: Furnish extra materials described below matching the products installed, packaged with protective covering for storage, identified with tags of type, color, installed location and quantity.

Furnish quantity of full size units equal to 2 % of total amount of each type of ceiling product including suspension system.

**PART 2 - PRODUCTS**

**ACCEPTABLE MANUFACTURERS:**

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:  
Armstrong World Industries, Inc.  
Celotex Corp.  
USG Interiors, Inc.

**ACOUSTICAL CEILING UNITS AND SUSPENSION:**

General: Provide manufacturer's standard units of configuration indicated which are prepared for mounting methods designated and which comply with noted standards and requirements, including those indicated by reference to type, form, pattern, grade, light reflectance coefficient, edge detail, and joint details if any.

Color, Texture and Pattern: Provide products to match appearance characteristics indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors, surfaces textures, and patterns available for acoustical ceiling units, and exposed metal suspension system members of quality designated.

Products: The following list of ceiling systems are based on one manufacturer's ceiling type and suspension grid, which may be incorporated in the project, but is not necessarily limited to the manufacturer indicated (refer to acceptable manufacturer's).

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Type 'A':**

Equal to Armstrong # 1754 Fine Fissured Open Plan 24"x 48"x 7/8", NRC = 0.75, CAC 35, Class A, Average light reflectance 0.86, (weight = 1.08 lbs./sf) Standard sag resistance, White in color. Suspension System: Prelude Fire Guard 15/16" Exposed Tee grid.

**METAL SUSPENSION SYSTEMS - GENERAL:**

Standard for Metal Suspension Systems: Provide metal suspension systems of the type, structural classification and finish indicated which comply with applicable ASTM C 635 requirements.

Finishes and Colors: Provide manufacturer's standard factory applied finish for type of system indicated. For exposed suspension members and accessories with painted finish, provide color as selected by Architect, from manufacturer's line of colors available.

Attachment Devices: size **for five (5) times** design load indicated in ASTM C 635, Table 1, direct hung.

Hanger Wire: Provide galvanized carbon steel wire, ASTM A 641, soft temper, pre-stretched, Class 1 coating, sized so that stress at 3-times hanger design load ( ASTM C 635 table 1, direct hung) will be less than yield stress of wire, but provide not less than 12 gauge.

Edge Moldings and Trim: Metal type and profiles indicated, provide manufacturer's revealed edge molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.

For Lay-in Panels with reveal edge details provide edge molding which forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

For Circular Penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

**EXPOSED METAL DIRECT-HUNG SUSPENSION SYSTEMS:**

Non-Fire Resistance - rated single web steel suspension system: Manufacturer's standard system roll-formed from pre-finished cold rolled steel sheet with 15/16" wide exposed face on flanges or structural members, with the following additional characteristics:

Structural Classification: **Heavy Duty System**

Finish: Painted, to match color of acoustical units.

**MISCELLANEOUS MATERIALS:**

Acoustical Sealant: Resilient, non-hardening, non-shrinking, non-staining, non-drying, non-sag sealant intended for interior sealing of concealed construction joints.

Equal to BA-98, Pecora Corp.

Tremco Acoustical Sealant, Tremco.

### **PART 3 - EXECUTION**

#### **Preparation:**

Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.

Install Suspension System in accordance with the layouts detailed on the reflected ceiling plans. If plan is not available, measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than -half width units at borders, and comply with reflected ceiling plans wherever possible.

#### **INSTALLATION:**

General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire-resistance rating requirements as indicated and CISCA standards applicable to the work.

Examine Substrata: for acceptable installation conditions. Do not proceed with work until conditions comply with requirements of manufacturer. Notify contractor and architect in writing of conditions detrimental to proper completion of scheduled work.

Install suspension system to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers not less than 6" from each end and spaced 4'-0" o/c along carrying channel or direct-hung runner, unless otherwise indicated, leveling to a tolerance of 1/8" in 12'-0". Install suspension system for earthquake resistant, seismic group 2, in accordance with current building code requirements.

Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fall with age or elevated temperatures.

Install hangers plumb and free from contact with insulation or other objects within the ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstruction and offset resulting horizontal force by bracing, counter-splaying or other equally effective means.

Install edge molding of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.

Sealant Bed: Apply continuous ribbon of acoustical sealant, concealed on back of vertical leg before installing moldings.

Screws attach moldings to substrate at intervals not over 16" o/c. and not more than 3 "from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely. Provide for expansion and contraction in holes at molding, allowing molding to move without showing signs of oil-canning.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders, space as recommended by panel manufacturer, unless otherwise indicated or required.

**CLEANING:**

Clean exposed surfaces of acoustical ceiling, including trim, edges moldings and suspension members, comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**END OF SECTION 09510**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 09650 - RESILIENT FLOORING**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1- Specification sections, apply to work of this section.

#### **DESCRIPTION OF WORK:**

**Extent** of resilient flooring and accessories is shown on drawings and specified herein: Standard 12" x 12"x 1/8" vinyl composition floor tile.

Refer to Stair Drawings for special tread/risers and platform Rubber Flooring.

#### **QUALITY ASSURANCE:**

**Manufacturer:** Provide each type of resilient flooring, stair treads and risers and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

**Fire Test Performance:** Provide resilient flooring which complies with the following fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

**Critical Radiant Flux (CRF):** Not less than 0.45 watts per sq., cm. per ASTM E 648

#### **SUBMITTALS:**

**Product Data:** Submit manufacturer's technical data for each type of resilient flooring and accessory.

**Samples for Selection Purposes:** Submit manufacturer's standard color charts in form of actual sections of resilient flooring, including accessories, showing full range of colors and patterns available, for each type of resilient flooring required.

**Maintenance Instructions:** Submit 2 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

#### **PROJECT CONDITIONS:**

**Maintain minimum temperature** of 65 degrees F in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient flooring materials in spaces where they will be installed



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 55 degrees F in areas where work is completed.

**Install resilient flooring and accessories** after other finishing operations, including painting, having been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.

## **PART 2 - PRODUCTS**

### **ACCEPTABLE MANUFACTURERS:**

**Manufacturer:** subject to compliance with requirements, provide products of one of the following:

Armstrong World Industries, Inc.  
Azrock Floor Products Div., Azrock Industries, Inc.  
Kentile Floors, Inc.  
Munsion Rubber Co.  
RCA Rubber Co.  
Johnson Rubber Co. Inc.

### **TILE FLOORING:**

**Vinyl Composition Tile:** Type IV, 12" x 12" unless otherwise indicated, and as follows:

**Composition 1:** Asbestos-free  
Gauge: 1/8"

### **ACCESSORIES:**

**Vinyl Wall Base:** Provide vinyl base complying with Type II with matching end stops and pre-formed or molded corner units, and as follows:

**Height:** 6" typically & 4" at indicated locations  
**Thickness:** 1/8" gauge  
**Style:** Standard top-set cove for VCT flooring and where carpet is indicated.  
**Finish:** Matte

**Adhesives:** Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.

**Concrete Slab Primer:** Non-staining type as recommended by flooring manufacturer.

**Leveling and Patching Compounds:** Latex types as recommended by flooring manufacturer.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

### **PART 3 - EXECUTION**

#### **INSPECTION:**

Require Installer to inspect sub floor surfaces, and to determine that they are satisfactory. A satisfactory sub floor is defined as one that is smooth and free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.

**Performance bond and moisture tests:** on concrete sub floors to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compounds.

**Do not allow resilient flooring work** to proceed until sub floor surfaces are satisfactory.

#### **PREPARATION:**

##### **Prepare sub floor surfaces as follows:**

**Use leveling and patching compounds** as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in sub floors.

**Remove coatings** from sub floor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint oils, waxes and sealers.

**Vacuum** floor surfaces to be covered by vinyl tile.

Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

#### **INSTALLATION, GENERAL:**

**Install resilient flooring** in strict compliance with manufacturer's printed instructions, Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.

**Scribe, cut, and fit resilient flooring to permanent fixtures**, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.

**Maintain reference markers**, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on sub floor. Use chalk or other non-permanent marking device. Install resilient flooring on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.

Tightly cement resilient flooring to sub base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.

**INSTALLATION OF TILE FLOORS:**

**Lay tile from center marks** established with principal walls, discounting minor offsets, so that tile at opposite edges of room area of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

**Match tiles for color and pattern** by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable.

Lay tile in "checkerboard" fashion with grain reversed in adjacent tiles. Provide for an accent strip around border of room, is shown on plans and depending on room dimension.

Except in Vestibule, where special pattern and color selections is indicated and required.

**Adhere tile** flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.

**INSTALLATION OF ACCESSORIES:**

**Apply wall base** to walls, columns, pilasters, casework and other permanent fixture in rooms or areas where base is required. Install base in lengths as long as practicable, with pre-formed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

**On masonry surfaces,** or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

**Place resilient edge strips** tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Apply resilient accessories** to stairs as indicated and in strict accordance with manufacturer's installation instructions.

**CLEANING AND PROTECTION:**

**Perform following operations** immediately upon completion of resilient flooring:

**Vacuum** floor thoroughly.

**Do not wash floor** until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.

**Damp-mop floor** being careful to remove black marks and excessive soil.

**Remove any excess adhesives** or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturers.

**Protect flooring** against damage during construction period to comply with resilient flooring manufacturer's directions.

**Protect resilient flooring** against damage from rolling loads for initial period following installation by covering with plywood or hardboard. Use dollies to move stationary equipment or furnishing across floors.

**Cover resilient flooring** with undyed, untreated building paper until inspection for substantial completion.

**Clean resilient flooring** not more than 4 days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean resilient flooring by method recommended by resilient flooring manufacturer. Provide three (3) coats of wax finish to the surface of the finished vinyl flooring as follows: One sealer coat, per manufacturer's recommendations.

Two Finish coats of high quality commercial floor wax.

**EXTRA STOCK:**

Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels. Furnish not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern and size installed.

**END OF SECTION 09650**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 09900 - PAINTING**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

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

#### **DESCRIPTION OF WORK:**

**Work includes** painting and finishing of new interior masonry/concrete walls, and gypsum board walls, doors and frames, including exposed items and surfaces throughout project and related items and/or surfaces that have had surfaces damaged in the execution of the work, except as otherwise indicated, and typically those items requiring painting found on projects of this nature.

Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

**Paint** as used herein means all coating system materials including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

**Surfaces to be painted:** Except where natural finish of materials is specifically noted as a surface not to be painted, paint exposed surfaces. If color or finish is not designated, Architect will select these from manufacturer's standard colors or finishes available.

**Shop Priming:** Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work, and similar items.

**Do not paint over CODE REQUIRED LABELS,** such as Underwriters' Laboratories and Factory Mutual, or any equipment identification performance rating, name or nomenclature plates.

### **QUALITY ASSURANCE**

**Single Source Responsibility** Provide primers and other under coat paint produced by same manufacturer as finish coats, Use only thinners approved by paint manufacturer, and use only within recommended limits.

**Coordination of Work:** Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates, Upon request from other trades, furnish information or characteristics of

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

finish materials provided for use, to ensure compatible prime coats are used.

### **SUBMITTALS:**

**Product Data:** Submit manufacturer's technical information in accordance with Section -01340. Submit manufacturer's specifications including paint label analysis and application instructions for each material specified. List each material and cross reference to the specific finish system specified. Identify by manufacturer's catalog number and general information.

**The Architect reserves the right** to select colors from manufacturer's pre-mixed colors and to vary the color of finishes on different surfaces throughout the project.

**Samples:** Prior to beginning work, the Architect shall be furnished color chips for surfaces to be painted. Use representative colors when preparing sample areas for review.

### **DELIVERY AND STORAGE**

**Deliver materials** to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information:

- Name or title of material.
- Manufacturer's name
- Contents by volume, for major pigment and vehicle constituents.
- Thinning instruction.
- Application instructions.
- Color name and number

**Store materials** not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.

Store in secure storage structures outside of the building or in areas of the building approved in writing by the Owner and local Fire Marshal.

Protect from freezing where necessary. Keep storage area neat and orderly.

Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

### **JOB CONDITIONS:**

**Apply water-base paints** only when temperature of surfaces to be painted and

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

surrounding air temperatures are between 50 degrees F. ( 10 degrees C) and 90 degrees F. ( 32 degrees C), unless otherwise permitted by paint manufacturer's printed instructions.

**Apply solvent-thinned paints** only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F. (7 degrees C), and 95 degrees F. ( 35 degrees C), unless otherwise permitted by paint manufacturer's printed instructions.

## **PART 2- PRODUCTS**

### **ACCEPTABLE MANUFACTURERS**

**Available Manufacturers:** subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

Benjamin Moore and Co. (Moore)  
PPG Industries, Pittsburgh Paints (Pittsburgh)  
Devoe (Devoe)  
Sherwin-Williams (S-W)

### **MATERIALS:**

**Material Quality:** Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint manufacturer. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.

Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.

**Color Pigments** Pure, non-fading, applicable types to suit substrates and service indicated.

### **EXECUTION:**

### **INSPECTION**

**Applicator must examine** areas and conditions under which painting work is to be applied and notify Contractor and Architect in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until all unsatisfactory conditions have been corrected in a manner acceptable to Applicator and paint manufacturer.

**Starting of painting work** will be construed as Applicator's acceptance of surfaces and

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

conditions within any particular area.

**Do not paint over dirt,** rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of durable paint film.

**SURFACE PREPARATION:**

**General:** Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

On existing paint finished surfaces, remove all loose coatings and prime all exposed substrata as specified. Roughen glazed areas and enamel painted areas with sandpaper and wipe clean with mineral spirits. Prime all stains with sealer recommended by manufacturer of finish coating system. Clean all open cracks of loose and unsound material. Fill all cracks, holes and surface imperfections less than 1/8" wide, with vinyl paste spackling compound and finish smooth.

Previously painted surfaces require no prime coat except as specified above. Spot prime all stains with "Stain Killer" formulated for specific stain encountered.

Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.

Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

**Cementitious Materials:** Prepare cementitious surfaces of concrete block, cement plaster and cement asbestos board to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.

Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

Clean concrete floor surfaces scheduled to be painted with a commercial solution of muriatic acid, or other etching cleaner. Flush with clean water to be neutralizing acid, and allow to dry before painting.



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Wood:** Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.

When transparent finish is required, use spar varnish for back-priming. Seal tops, bottoms, and cut-outs (hardware openings etc.) of unprimed wood doors with heavy coat of colored varnish or equivalent sealer immediately upon delivery to job.

**Ferrous Metals:** Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

Touch up shop applied prime coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.

**Galvanized Surfaces:** Clean free of oil and surface contaminants with non-petroleum based solvent.

**MATERIALS PREPARATION:**

**Mix and prepare painting materials** in accordance with manufacturer's directions.

**Maintain containers used in mixing** application of paint in a clean condition, free of foreign materials and residue.

**Stir materials before application** to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

**APPLICATION:**

**General:** Apply paint in accordance with manufacturer's directions, Use applicators and techniques best suited for substrate and type of material being applied. The Contractor is also hereby notified that painting of surfaces is to begin early in day and be completed no later than noon of same day to allow sufficient drying time. Coordinate with

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

requirements of Summary of Work for Contractor's work limits.

Provide finish coats which are compatible with prime paints used.  
Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance.  
Give special attention to insure that surfaces, including edges, corners, crevices, welds,  
and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

**SCHEDULING PAINTING:** Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

**Allow sufficient time** between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

**Minimum Coating Thickness:** Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

**Mechanical and Electrical Work:** Painting of mechanical and electrical work is limited to those items exposed on exterior surfaces and in occupiable spaces.

**Prime Coats:** Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by factory

Re-coat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

**Pigmented (Opaque) Finishes:** Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage, Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

**Completed Work:** Match approved sample areas for color, texture, coverage and quality of workmanship. Remove refinish or repaint work not in compliance with specified requirements.

**CLEAN UP AND PROTECTION:**

**Clean-up:** During progress of work, remove from site discarded paint materials, rubbish,

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

cans and rags at end of each work day.

**Upon completion of painting work**, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

**Protection:** Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

At completion of work of other trades, touch up and restore all damaged or defaced surfaces.

## **EXTERIOR PAINT SCHEDULE**

### **Paint Wood Trim:**

#### **Full gloss alkyd for Deep Colors: 2 finish coats over primer**

Prime Coat: Exterior Primer Coating (FS TT-P-25)  
Benjamin Moore: Fresh Start All purpose 100% Acrylic Primer 023  
Devoe: 1102 All Weather Alkyd House Paint Primer  
Pittsburgh: 6-9 Speedhide Exterior Wood Primer  
S-W: SWP exterior Gloss Finish

#### **Low Luster Finish: 2 coats**

First and Second Coats: Alkyd-oil Paint for Wood Shakes and Rough Siding (FS-TT-P-52)  
Benjamin Moore: MoorGuard 103 Low Lustre Fortified Acrylic  
Devoe: 14XX DE-Vo-K0 Exterior alkyd Flat Shake Paint  
Pittsburgh: 6-Line Speedhide Exterior Wood Finishes  
S-W: S-W Exterior Solid Stain

## **INTERIOR PAINT SCHEDULE:**

**General:** Provide the following paint systems for the various substrates and locations, as indicated.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Concrete and Concrete Masonry Units and Brick:  
Semi-Gloss Enamel:**

Filler Coat: Solvent-Thinned Block Filler. Apply 2 filler coats at a rate to ensure complete coverage with pores filled.

Moore: Moore's Waterproofing Masonry Paint.  
S-W: S-W Pro-Mar Block Filler.

First Coat: Enamel Undercoat.

Moore: Moore's Alkyd Enamel Underbody.  
S-W: S-W Pro-Mar Alkyd Semi-Gloss Enamel.

Second Coat: Odorless Interior Alkyd Semi-Gloss Enamel.

Moore: Moore's Satin Impervo Enamel.  
S-W: S-W Pro-Mar Alkyd Semi-Gloss Enamel

**FERROUS METAL**

**Semi-Gloss Enamel Finish:** 2 Finish Coats over primer, with total dry film thickness not less than 2.5 mils. Apply to all ferrous metal surfaces unless indicated otherwise.

**Prime Coat:** Red Lead Pigmented Primer . Primer is not required on items delivered shop primed.

Devoe: 41821 Bar-Ox Red Lead Metal Primer  
Moore: Iron-Clad Retardo Rust Inhibitive Paint  
Pittsburgh: U6104 Speedhide Red Lead Primer  
S-W: S-W Kromik Metal Primer

**Second and Third Coat:** Interior Enamel Undercoat

Devoe: 8801 Velour Alkyd Enamel Undercoat  
Moore: Moore's Alkyd Quick-Drying Enamel  
Pittsburgh: 6-6 Speedhide Quick-Drying Enamel Undercoat  
S-W: S-W Pro-Mar Alkyd Semi-Gloss

**Galvanized Metal:**

**Prime Coat:** Zinc Dust - Zinc Oxide Primer Coating

Moore: Iron-Clad Galvanized Metal Primer.  
PPG: 6-215 / 6-216 Speedhide Galvanized Steel Paint.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

S-W: S-W Galvanized Iron Primer.  
Second Coat: Interior Enamel Undercoat./

Moore: Moore's Alkyd Enamel Underbody.  
S-W: S-W Pro-Mar Alkyd Semi-gloss.  
PPG: 6-6 Speedhide quick-Drying Enamel Undercoater.

Third Coat: Odorless Interior Semi-Gloss Alkyd Enamel.

Moore: Moore's Satin Impervo Enamel.  
PPG: 27-109 Wall-Hide Semi-Gloss Enamel.  
S-W: S-W Pro-Mar Alkyd Semi-Gloss Enamel.

**GYPSUM DRYWALL:**

**LUSTERLESS (FLAT) EMULSION FINISH:** 3 coats ( 1 primer 2 finish), apply to all gypsum drywall unless indicated otherwise.

**First Coat:** Interior Latex Base Primer coat

Devoe: 50801 Wonder-Tones Latex Flat Wall Paint  
Moore: Moore's Latex Quick-Dry Prime Seal  
Pittsburgh: 6-2 PPG Quick-Drying Interior Latex Primer Sealer  
S-W: S-W Pro-Mar Latex Wall Primer

**Second and Third Coat:** Interior Flat Latex Base Paint

Devoe: 36XX Wonder-Tones Interior Latex Flat Wall Paint  
Moore: Moore's Regal Wall Satin  
Pittsburgh: 6-7 Speedhide Latex flat Wall Paint

**EPOXY FINISHES:**

**Wall Surfaces: (Truck Bay - Gypsum Board Surfaces)**

**First Coat:** Water Base – Masonry Walls – Gloss Finish  
S-W: Water Based Catalyzed Epoxy B70/B60V15  
Pittsburg: Water Based Pitt-Glaze – Interior / Exterior Block Filler.  
Moore: IMC Waterborne Epoxy Block Filler

**Second Coat and Third Coats:**

S-W: Water Based Catalyzed Epoxy B70/B60V15  
Pittsburg: Water Based Pitt-Glaze Epoxy 16-801/16-802  
Moore: IMC Polyamide Epoxy Gloss  
S-W Pro-Mar 400 Latex Flat Wall Paint

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**PAINTED WOODWORK:**

**Semi-Gloss Enamel Finish:** 3 Coats

**First Coat:** Interior Enamel Undercoat

|             |   |
|-------------|---|
| Devoe:      | 8801 Velour Alkyd Enamel Undercoat            |
| Moore:      | Moore's Alkyd Enamel Underbody                |
| Pittsburgh: | 6-6 Speedhide Quick-Drying Enamel Undercoater |
| S-W:        | S-W Wall and Wood Primer                      |

**Second and Third Coats:** Odorless Interior Semi-Gloss Enamel

|             |                                     |
|-------------|-------------------------------------|
| Devoe:      | 26XX Velour Alkyd Semi-Gloss Enamel |
| Moore:      | Moore's Satin Impervo Enamel        |
| Pittsburgh: | 2-109 Wall-Hide Semi-Gloss Enamel   |
| S-W:        | S-W Pro-Mar Alkyd Semi-Gloss Enamel |

**TRANSPARENT STAIN & VARNISH**

**Interior finished Wood:** (Follow AWI Standards for field finishing)

**Stain Coat:** Interior Oil Stain

|        |                         |
|--------|-------------------------|
| Moore: | Benwood Interior Stain. |
| S-W:   | S-W oil stain.          |

**First Coat:**

|        |                                     |
|--------|-------------------------------------|
| Moore: | Moore's Benwood Paste wood filler   |
| S-W:   | S-W Pro-Mar Varnish Sanding Sealer. |

**Filler Coat on Open Grain Wood:** Paste Wood filler, wiped before first varnish coat.

|        |                                       |
|--------|---------------------------------------|
| Moore: | Moore's Benwood Satin Finish Varnish. |
| S-W:   | S-W Sher-wood Fast-Dry Filler.        |

**Second Coat:** Oil Rubbing Varnish.

|        |                                       |
|--------|---------------------------------------|
| Moore: | Moore's Benwood Satin Finish Varnish. |
| S-W:   | S-W Oil Base Varnish, gloss.          |

**END OF SECTION 09900**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 10522 -FIRE EXTINGUISHERS, CABINETS, & ACCESSORIES**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

#### **DESCRIPTION OF WORK:**

**Extent** of fire extinguishers, cabinets and accessories are indicated on the drawings and specified here-in.

**Types of products** required include:  
Surface mounted Fire extinguishers.  
Mounting brackets.

#### **QUALITY ASSURANCE:**

**Single Source Responsibility:** Obtain products in this section from one manufacturer.

**Coordination:** Verify that fire extinguisher cabinets are sized to accommodate fire extinguishers of type and capacity indicated.

**UL-Listed Products:** Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

#### **SUBMITTALS:**

**Product Data:** Submit product data for each type of product included in this section. For fire extinguisher and cabinets include roughing-in dimensions and details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, and panel style and materials.

**For initial selection** of colors and finishes, submit manufacturer's color cards showing full range of standard colors available.

### **PART 2-PRODUCTS**

#### **ACCEPTABLE MANUFACTURERS:**

**FIRE EXTINGUISHERS, CABINETS, & ACCESSORIES 10522 - 1**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

**FIRE EXTINGUISHERS:**

**General:** Provide fire extinguishers for each extinguisher cabinet and/or wall mounted indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities. Provide and install identification signage for each fire extinguisher equal to Seton Identification & Safety Experts # 39440 self luminous.

**Fill and service extinguishers** to comply with requirements of governing authorities and manufacturer's requirements.

**Abbreviations** indicated below to identify extinguisher types related to UL classification and rating system and not, necessarily to type and amount of extinguishing material contained in extinguisher.

**Multipurpose Dry Chemical Type:** UL-rated 4A-60-BC, 10 lb. (5" dia. x 20 1/2") nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

**MOUNTING BRACKETS:**

Provide manufacturer's standard brackets designed to prevent accidental dislodgment of extinguisher, of sizes required for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.

Provide brackets for extinguishers not located in cabinets.

Provide brackets for extinguishers not located in cabinets and for those located in cabinets, where indicated or required.

**PART 3-EXECUTION**

**INSTALLATION:**

**Install items** included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

**Securely fasten** mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions. Where exact location of surface-mounted cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.

**FIRE EXTINGUISHERS, CABINETS, & ACCESSORIES 10522 - 2**



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**IDENTIFICATION:**

**Identify bracket-mounted extinguishers** with red letter decals spelling "**FIRE EXTINGUISHER**" applied to wall surface. Letter size, style and location as selected by Architect.

**END OF SECTION 10522**

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

## **SECTION 10800 - TOILET AND BATH ACCESSORIES**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

#### **DESCRIPTION OF WORK:**

Extent of each type of toilet accessory is indicated on drawings and schedules.

Types of toilet accessories required include the following:

Fixed grab bars (GB) of varying lengths

Swing up Grab bars (DGB)

Paper towel dispenser/waste receptacle. (PTD/WR)

Toilet tissue dispenser. (TTD)

Soap dispenser. (SP)

#### **QUALITY ASSURANCE:**

Inserts and Anchorage: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

#### **SUBMITTALS:**

Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices and cut-out requirements in other work.

### **PART 2 - PRODUCTS**

#### **ACCEPTABLE MANUFACTURERS:**

Available Manufacturer: Subject to compliance with requirements, manufacturers offering toilet accessories which may be incorporated in the work include, but are not limited to, the following:

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Bobrick Washroom Equipment, Inc.  
Bradley Corporation.  
Parker-Scovill.  
ASI Manufacturing

Drawings and specifications are based on one manufacturer's standard toilet accessories Bobrick, Inc."another manufacturer's toilet accessories of similar and equivalent nature may be acceptable when the differences do not materially detract from the design and its intent and performance as judged solely by the Architect.

**MATERIALS, GENERAL:**

Stainless Steel: ANSI Type 302/304, with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.

Brass: Leaded and unleaded, flat products, Rods, shapes, forgings, and flat products with finished edges.

Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gauge minimum, unless otherwise indicated. Surface preparation and metal pre-treatment as required for applied finish.

Galvanized Steel Sheet: ASTM A 527, G60.

Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

**PAPER TOWEL DISPENSER: (PTD)**

Paper Towel Dispenser: Fabricate of stainless steel for standard recessed mounting in gypsum board and metal wall system, sized to dispense not less than 350 C-fold or 475 multi-fold paper towels without use of special adapters, door equipped with tumbler lockset. Equal B262, one per lavatory area.

**TOILET TISSUE DISPENSERS: (TTD)**

Roll-Dispenser: Fabricated of 18 gauge type 304 stainless steel double roll, with stainless steel shelf, sized for two rolls at 1800 sheets. Equal to Bobrick B-2888. One per stall/toilet space. (Submit to partition manufacturer support requirements).

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**GRAB BARS:**

Stainless Steel Type: Provide grab bars meeting ADA requirements with wall thickness not less than 18 gauge, type 304 non-slip stainless steel, with concealed mounting and cover plates for specific type wall construction. Grab bars to be constructed, fabricated, and supported following ANSI 117.1 Standard for Handicapped Use, Equal to Bobrick B-6806 series, concealed mounting, on lengths indicated on drawings and specified here-in.

Grab bar lengths, configuration, general location, elevations and substrata material are indicated on Contract Documents. Contractor to review and schedule grab bars, from plan & elevations. All work to be securely fastened into each type of substrata, including providing of all required fasteners, anchors, receivers, cover plates etc. which are required for this type of installation

Typical Configurations: Straight Horizontal - 1 1/2" diameter x 36" long at back of toilet: 1 1/2" diameter x 3'-6" long at side of toilet. Equal Bobrick B-6806, one set per handicapped designated stalls or room.

Special Configuration: Swing up type, wall mounted bracket, with backplate and 30" long arm. Designed to be easily lowered and locked in place. Equal to Bobrick B-490 series - swing up wall mounted with wall clearance for back bar. Refer to manufacturer's specifications sheet for details.

Mounting: Concealed, manufacturer's standard flanges and anchorage.

Clearance: 1-1/2" clearance between wall surface and inside face of bar.

Gripping Surfaces: Manufacturer's standard non-slip texture where installed in shower areas.

Heavy-Duty Size: Outside diameter of 1-1/4".

**SOAP DISPENSERS:**

Liquid Soap Dispenser, in counter mounted: Minimum 34 oz. capacity plastic bottle with vandal resistant spout. Unit is filled from the countertop side. Bobrick B-8226 6" spout, lavatory mounted dispenser, one soap dispenser per lavatory, unit mounted typically to left side whenever possible.

**MIRROR UNITS:**

Provide mirror units fixed to wall surfaces and having a fabricated angle frame shaped as required to hold and secure the mirror in place, constructed of not less than 18 gauge (.050") with squared and mitered corners, welded, and ground smooth. Provide frame in satin polished finish. Mirror to be 1/4" type 1, class 1, quality q2 with silvering, copper coating, and protective organic coating. Polished tempered glass.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Provide mirror units as follows:**

Restrooms: 24" high x 60" with bottom of mirror set no more than 40" AFF (one above lavatory) & 24" wide x 72" high full length mirror set so the bottom is 12" AFF and adjacent to lavatory wall ( typically on the wall adjacent to restroom door) Equal to Bobrick B-290 -2460 @ lav's & B-290-2472 wall.

**FABRICATION:**

General: Only an unobtrusive stamped logo of manufacturer, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

**PART 3 - EXECUTION**

**INSTALLATION:**

Install toilet accessory units in accordance with manufacturers' instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

**ADJUSTING AND CLEANING:**

Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

Clean and polish all exposed surfaces after removing temporary labels and protective coatings.

**END OF SECTION 10800**

Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.

## **SECTION 13122 - PRE-ENGINEERED METAL BUILDING**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 1 Specification section apply to work of this section.

#### **1.02 DESCRIPTION OF WORK:**

**Work Included:** Furnish and install a Metal Building Manufacturers Association steel building as described and specified herein and on the drawings, as needed for a complete and proper installation, ready for operation.

**Building Type:** The building is a single story, single-span, rigid frame-type pre-engineered metal building of the normal length, width, eave height and roof pitch indicated.

***THIS BUILDING CONTAINS UNIQUE FEATURES AND REQUIREMENTS THAT ARE NOT NECESSARILY STANDARDS WITH ALL PRE-ENGINEERED BUILDING MANUFACTURERS. THE CONTRACTOR SHALL READ THESE SPECIFICATIONS AND STUDY THE DRAWINGS CAREFULLY AND SHALL PROVIDE FOR ALL NON-STANDARD CONSTRUCTION DETAILS IN HIS BID.***

**Foundation Fit-Up:** The pre-engineered building shall be designed to fit on the foundation shown on the Drawings. Bay spacing shall be as shown on the Drawings. Before submitting the Bid, the Contractor shall verify that his proposed frame can accommodate the bay sizes shown on the Drawings and that the foundations and reinforcing shown are of the proper configuration, size and capacity to support his proposed building. The pre-engineered metal building designer shall assume pinned column bases in their design. The Contractor shall provide for in its bid, any and all costs associated with any changes to the building dimensions and foundation details shown on the Drawings.

**Exterior Walls:** Pre-engineered standard Girts, sized for bay spacing and State of Connecticut wind and design loads.

**Roof System:** Standing seam insulated roof.

Personal doors, frames, and finish hardware are specified in Division 8 Section. Manufacturer's standard building components and accessories may be used, provided components, accessories, and complete structure conform to design indicated and specified requirements.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

### **1.03 SYSTEM PERFORMANCE:**

**Performance Requirements:** Design, fabricate, and erect the building to withstand loads from wind, gravity, and structural movements to resist in-service use without failure. Design members to withstand stresses resulting from combinations of loads that produce maximum allowable stresses prescribed in MBMA's "Design Practices Manual".

**Design Loads:** As defined in current Building Code IBC known as (Connecticut Basic Building Code).

Design Wind Uplift Loads: Refer to Structural drawings and specifications.

Design Snow Loads: Refer to Structural drawings and specifications.

Building to meet current energy requirements of IBC 2003 and Connecticut Supplements 2005 through 2013 updates for use type.

**Structural Framing and Roof and Siding Panels:** Design structural members and exterior covering for applicable loads and combinations of loads in accordance with the MBMA's "Design Practices Manual."

**Structural Steel** Comply with AISC's "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.

**Light Gauge Steel:** Comply with ASCI "Specifications for the Design of Cold-Formed Steel Structural members" and "Design of Light Gauge Steel Diaphragms" for design requirements and allowable stresses.

**Welded Connection:** Comply with AISI's "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.

**Warranties:** Provide Manufacturer's 3 year limited warranty on materials and workmanship, 20 years on roof and wall panel finish and 20 years on weather tightness. Warranties and guarantees by the suppliers of various components in lieu of a single source responsibility by the manufacturer will not be accepted. The manufacturer shall be solely responsible for the guarantee of the pre-engineered building and all its components.

### **1.04 SUBMITTALS:** Submit the following:

**Product Data:** Include manufacturer's product information for building components and accessories. Provide technical data on all components required for this project.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Shop Drawings:** Provide detailed shop drawings for the building, complete with all structural framing, roofing, siding panels, fastener types, and components and accessories not fully detailed or dimensioned in manufacturer's product data.

**Structural Framing:** Furnish erection drawings. Include fabrication and assembly details. Show anchor bolts settings, sidewall, endwall, and roof framing.

**Certification:** Prepared and signed by a Professional Engineer, licensed to practice in the State of Connecticut, verifying that structural framing and covering panels meet Connecticut loading requirements and codes. Include structural calculations showing the design loads applied to the structure and all column end reactions.

#### **1.05 QUALITY ASSURANCE:**

**Installers Qualifications:** Engage an experience Installer who specializes in erection of buildings similar to that required and is certified by the building manufacturer as qualified for erection of the manufacturer's product. The Installer shall have a minimum of 5 years working experience with the Building Manufacturer's Product.

**Manufacturers Qualifications:** Provide buildings manufactured by a firm experienced in manufacturing buildings similar to those indicated. Manufacturer shall be a current member of MBMA.

#### **1.06 JOB CONDITIONS:**

Coordinate work of this section with that of other trades and subcontractors for proper sequencing and installation, Field verify all column line dimensions, anchor bolt locations, and required connections to the building foundation, prior to fabrication and delivery of structural system.

#### **1.07 DELIVERY AND STORAGE:**

Deliver all materials properly identified, and in sequence of construction. Inspect all building components for damage prior to off loading. Prepare written report of materials conditions and submit to the Architect / Engineer for record. Reject any and all damaged components.

Stock, place and store components in logical sequence of erection under cover and protected from weather and other forms of damage.

### **PART 2 - PRODUCTS**

**Materials:** Provide the following:



**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

1. Hot Rolled Structural Steel Shapes: ASTM A 36.
2. Steel Tubing or Pipe: ASTM A 500, Grade B, ASTM A 501 or
3. ASTM A 53.
4. Steel members Fabricated from Plate or Bar Stock: ASTM A 529, A570 or A 572.
5. Provide 42,000 psi minimum yield strength.
6. Steel Members Fabricated by Cold Forming: ASTM A 607, Grade 50
7. Cold Rolled Carbon Steel Sheet: ASTM A 366 or ASTM A 568.
8. Hot Rolled Carbon Steel Sheet: ASTM A 568 or ASTM A 569.
9. Structural Quality Zinc coated (Galvanized) Steel Sheet: ASTM A 446 with G90 coating complying with ASTM A 525.
10. Aluminum Coated Steel Sheets: ASTM A 463 with TI-40 coating.
11. Aluminum Sheets: ASTM B 209 for Alcad alloy 3003 or 3004 temper required to suit forming operations.
12. Bolts for Structural Framing ASTM A 307 or ASTM A 325 as necessary for design loads and connection details.

**Thermal Insulation:** Glass fiber blanket. Comply with ASTM C 991, 0.5 lb per cu ft. density, thickness indicated with UL flame spread classification of 25 or less and 2 inch wide continuous vapor tight edge tabs.

**Vapor Barrier:** Vinyl film – White in color.

**Paint Materials:** Comply with performance requirements of federal specifications indicated.

**Shop Primer for Ferrous Metal:** Fast curing lead free, universal primer. Comply with FS TT-P-645.

**Hot-Dipped Galvanizing:** All structural steel and secondary structural members that is located in exterior unheated spaces, including steel directly exposed to the weather, shall be hot dip galvanized in accordance with ASTM A-386.

**Structural framing:** As follows:

1. **Rigid Framing:** Factory welded, shop painted, built-up "I beam" shape consisting of roof tapered or parallel flange beams and tapered or straight columns with attachment plates, bearing plates and splice members. Factory drill for field bolted assembly. Provide length of span and spacing indicated.
2. Provide rigid frames at endwalls.
3. **Primary Endwall Framing:** Provide the following framing members fabricated for field bolted assembly.
4. **Endwall Columns:** Shop painted, built up, factory welded "I" shape or cold formed "C" sections, fabricated from 14 gauge (0.0747 inch) steel, minimum.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Secondary Framing:** Provide the following:

1. Roof Purlins, Sidewall and Endwall girts: 16 gauge (0.0598 inch) shop painted roll formed steel "C" or "Z" sections minimum. Fabricate purlin spacers from roll formed galvanized steel sections.
2. Eave Struts: Unequal flange 16 gauge (0.0598 inch) shop painted roll formed steel "C" sections formed to provide adequate backup for both wall and roof panels.
3. Flange and Sag Bracing: 1-5/8" by 1-5/8" angles fabricated from 16 gauge (0.0598 inch) shop painted roll formed steel.
4. Base or Sill Angles: 14 gauge (0.0747 inch) cold formed galvanized steel sections.
5. Secondary Endwall structural members, except columns and beams, shall be fabricated from 14 gauge (0.0747 inch) cold formed galvanized steel.
6. Adjustable Wind Bracing: 1/2 inch diameter (minimum) threaded steel rods; comply with ASTM A 36 or ASTM A 572, Grade D.
7. Bolts: Provide zinc or cadmium plated bolts when structural framing components are in direct contact with roofing and siding panels. In other cases provide shop painted bolts.

**Shop Painting:** Clean surfaces of loose mill scale, rust, dirt, oil, grease and other matter. Follow procedures of SSPC-SP3 for power tool cleaning, SSPC-SP7 for brush off blast cleaning and SSPC-SP1 for solvent cleaning.

Prime framing members with rust-inhibitive primer.

Prime galvanized members after phosphoric acid treatment with zinc dust- zinc oxide primer, as applicable.

**Roofing Panels:** As follows:

1. Face Sheets: Fabricate roof panel face sheets to profile or configuration indicated from 26 gauge (0.00179 inch) drawing quality pre-finished steel sheets (per ASTM A 792) with Kynar 500, 20 year finish.
2. All metal roofing shall be designed, fabricated and erected to withstand the loading conditions designed, without loss of weathertightness, without permanent distortion and without damage to any part of the installation.
3. Fasteners: Self tapping screws, bolts, nuts, self locking rivets, self locking bolts, end welded studs, and other suitable fasteners designed to withstand design loads. Provide metal backed neoprene washers under heads of fasteners bearing on weather side of panels.
4. Use aluminum or stainless fasteners for exterior applications and galvanized or cadmium plated fasteners for interior applications.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

5. Space fastenings in vertical and horizontal alignment. Use proper tools to obtain uniform compression for positive seal without rupture or neoprene washer.
6. Provide fastener heads with factory applied coating matching color of roofing sheets.

**Insulation:** Insulation shall consist of fiberglass blanket between wall girts roof purlins and roof panels. Blankets shall be attached to each other and be specifically designed for this type of installation. A vapor integrity shall be provided by laminating facing with Vinyl Scrim Polyester, meeting minimum insulation requirements of the most current International Energy Efficiency Code (IECC). Insulation shall have a flame spread of 25 or less with smoke developed 50 or less per UL-723 and ASTM E-84. Insulation shall be designed to produce the minimum number of seams, and all exposed seams shall be sealed with foil faced, vapor tight tape, minimum of 3" wide.

**Standing Seam Roof Panels:** Factory formed standing seam roof panel system designed with a minimum 36" width, with 1-1/4" ribs at not more than 12" O.C., for mechanical weathertight attachment to roof purlins using a concealed clip. Form panels of 26 gauge (0.0179 inch), Grade C, zinc coated steel sheets.

**Clips:** 16 gauge (0.0598 inch) panel clips

**Cleats:** 24 gauge (0.0239 inch) Grade C, zinc coated steel sheets, factory caulked, mechanically seamed cleats.

**Fasteners:** Self tapping screws, bolts, nuts, self-locking rivets, self locking bolts, end welded studs and other suitable fasteners designed to withstand design loads. Provide metal backed neoprene washers under heads of fasteners bearing on weather side of panels.

Use aluminum or stainless fasteners for exterior applications and galvanized or cadmium plated fasteners for interior applications.

Space fastenings in vertical and horizontal alignment. Use proper tools to obtain uniform compression for positive seal without rupture or neoprene washer.

Provide fastener heads with factory applied coating matching color of roofing sheets.

**Accessories:** Provide flashings, closers, fillers, expansion joints, ridge covers, fascias and other accessories formed of the same material and finish as roof and wall panels.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

**Closure Strips:** Closed cell self extinguishing, expanded cellular rubber, flexible closure strips, shaped to match configuration of roofing and siding sheets.

**Sealing Tape:** Permanently elastic, pressure sensitive nonsag, nontoxic, non-staining 100 percent solids grey polyisobutylene compound tape 1/2 inch wide and 1/8 inch thick with release paper backing.

**Joint Sealant:** One part elastomeric polyurethane polysulfide or silicone rubber sealant. Color as selected from the manufacturers standard colors to match roof or siding panels.

**Flashing and Trim:** Exposed flashings and trim shall be a minimum of 26 gauge and shall be the same finish as the wall/roof panels.

**Roof Panels:** Panels shall be a galvanized sheet steel. Finishes shall be warranted for 20 years against rupture, structural failure or perforation due to normal atmospheric corrosion. ASTM 525 Class G90, exposed panel surface to receive manufacturer's standard 20 year Kynar finish selected from manufacturer's standard color chart.

**Finish:** Apply 2-coat system to pretreated steel. Coating shall consist of specially formulated inhibitive primer applied to dry film thickness of .15 mil and color coat containing not less than a dry film thickness of 0.5 mils to 1.3 mils.

**Color:** Selected by Owner

**Gutter, Rainwater Leaders & Downspouts:** Provide complete and operational water collection system consisting of the following:

**Gutters:** Form continuous, 26 gauge minimum with end pieces, outlet tubes and other special pieces. Size in accordance with International Plumbing Code (IPC) for Rain Intensity and Collection, and SMACNA. Join sections with riveted and sealed joints. Provide expansion type lip joint at center of runs. Furnish gutter supports 24" on center, constructed of same metal as gutters. Provide aluminum wire ball strainers at outlets. Finish to match wall panels.

**Downspouts:** Form with elbows and offsets. Join sections with 1-1/2" telescoping joints. Provide fasteners designed to hold downspouts 1 inch away from walls; locate fasteners at top and bottom and approximately 5 feet on center in between. Finish to match wall panels.

**Sizing:** Design roof gutter and RWL's based on the following criteria:

Roof pitch, slope, and finish

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Rainfall intensity based on Connecticut 100 year storm  
Gutter slope and size  
RWL size and spacing

Provide calculations showing collection areas, rainfall maps & intensity, gutter capacity, rainwater leader size and capacity.

**Sealants, Mastics, and Closures:** Tube sealant shall be a synthetic elastomer based material which becomes tack free in less than 2 hours, but remains flexible. Service range shall be 30 degrees F to 160 degrees F.

Tape Mastic shall be preformed butyl rubber based compound.

Panel Closures shall be ethylene-propylene-Diene-Monomer or equivalent. Closed cell strips formed to match panel configuration.

**PART 3 - EXECUTION**

**3.01 FABRICATION:**

Design components and field connections required for erection to permit easy assembly and disassembly.

Fabricate components so once assembled, they may be disassembled, repackaged and reassembled with a minimum amount of labor.

Clearly mark each part of the assembly to correspond with erection drawings, diagrams and instruction manuals.

**Structural Framing:** Shop fabricate framing components to indicated size and section with base plates, bearing plates, and other plates required for erection welded in place. Provide holes for anchoring, shop drilled connections, or punched to template dimensions.

Align bottom of wall panels and fasten with blind rivets, bolts or self tapping screws. Fasten flashings, trim around openings and similar elements with self tapping screws.

Fasten window and door frames with machine screws or bolts. When building height requires two rows of panels at gable ends, align lap of gable panels over wall panels at eave height.

**Town of Voluntown  
Public Works Garage  
96 Gate Street  
Voluntown, CT.**

Install screw fasteners with power tools having controlled torque to compress neoprene washer tightly without damage to washers, screw threads, or panels. Install screws in predrilled holes.

Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

**Sheet Metal Accessories:** Install gutters, downspouts and other accessories for positive anchorage to building and weathertight mounting. Adjust operating mechanisms for precise operation.

**Roof Panels:** Provide manufacturer's minimum end laps and 1½" corrugation side laps.

Align horizontal laps with adjacent roofing and siding panels  
Seal intermediate end laps and side laps with translucent mastic.  
Clean panels in accordance with manufacturer's instructions.

### **3.02 CLEAN UP AND TOUCH UP:**

Clean component surfaces. Touch up abrasions, marks, skips or other defects to shop primed surfaces with same material as shop primer.

**END OF SECTION 13122**

**SPECIFICATIONS DIVISIONS 13, 15 & 16 - TABLE OF CONTENTS**

**DIVISION 15**

|       |   |
|-------|---|
| 15010 | Basic Mechanical Requirements           |
| 15050 | Basic Mechanical Materials and Methods  |
| 15100 | Valves                                  |
| 15140 | Supports and Anchors                    |
| 15190 | Mechanical Identification               |
| 15250 | Mechanical Insulation                   |
| 15282 | Gas Detection System                    |
| 15411 | Water Distribution Piping               |
| 15420 | Drainage and Vent Systems               |
| 15489 | Facility Liquefied Petroleum Gas Piping |
| 15700 | HVAC Split Systems                      |
| 15830 | Terminal Units                          |
| 15850 | Makeup Air Units                        |
| 15870 | Power Ventilators                       |
| 15891 | Metal Ductwork                          |
| 15910 | Ductwork Accessories                    |
| 15932 | Air Outlets and Inlets                  |
| 15990 | Testing, Adjusting and Balancing        |

**DIVISION 16**

|       |  |
|-------|--|
| 16010 | Basic Electrical Requirements          |
| 16050 | Basic Electrical Materials and Methods |
| 16110 | Raceways                               |
| 16120 | Wires and Cables                       |
| 16135 | Cabinets, Boxes and Fittings           |
| 16143 | Wiring Devices                         |
| 16170 | Circuit and Motor Disconnects          |
| 16190 | Supporting Devices                     |
| 16195 | Electrical Identification              |
| 16420 | Service Entrance                       |
| 16452 | Grounding                              |
| 16470 | Panelboards                            |
| 16475 | Overcurrent Protective Devices         |
| 16495 | Automatic Transfer Switches            |
| 16515 | Interior Lighting                      |
| 16621 | LP Gas Generators                      |
| 16721 | Fire Alarm System                      |

END OF TABLE OF CONTENTS

**SECTION 15010 - BASIC MECHANICAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. General: Materials and methods for performance of all mechanical work.
- B. Provide complete and operational mechanical systems including, but not limited to, all required materials, parts, equipment, labor, tools, and accessories.

**1.2 SUMMARY**

- A. This Section includes general administrative and procedural requirements for mechanical installations.
  - 1. Codes & standards.
  - 2. Submittals.
  - 3. Quality control.
  - 4. Permits, fees, and inspections.
  - 5. Schedule and sequence.
  - 6. Project and site conditions.
  - 7. Delivery, storage, and handling.
  - 8. Record documents.
  - 9. Operation and Maintenance manuals.
  - 10. Warranties and guaranties.
  - 11. Rough-ins.
  - 12. Mechanical installations.
  - 13. Cutting, patching, and firestopping.
  - 14. Mechanical identification.

**1.3 CODES AND STANDARDS**

- A. Except as modified by governing codes, comply with applicable provisions and recommendations of the following:
  - 1. ANSI Standards.
  - 2. Owner's Insurance Company.
  - 3. Current Connecticut Laws and Statutes.

**1.4 SUBMITTALS**

- A. Increase, by the quantity listed below, the number of mechanical related shop drawings, product data, and samples submitted, to allow for required distribution.



1. Shop Drawings: Initial Submittal: 1 additional blue- prints.
  2. Product Data: 1 additional copy of each item.
  3. Samples: 1 addition as set.
- B. Additional copies may be required by individual sections of these Specifications.
- C. Shop Drawings:
1. Submit for review, detailed shop drawings and product data of all the equipment and material required to complete the work. No material or equipment may be delivered to the jobsite or installed until accepted shop drawings for the particular material or equipment have been approved by the Owner or his authorized representative.
  2. Failure to submit shop drawings in ample time for checking will not entitle Contractor to claim extension of Contract time, or increase in contract cost.
  3. The proposed piping layout for the Boiler system is required.
- D. Tests & Certificates:
1. As specified in other sections.

### 1.5 QUALITY ASSURANCE

- A. Drawings:
1. Drawings are diagrammatic. They indicate the general arrangement of systems and work included in the contract. Drawings are not to be scaled. Site and Architectural drawings and details shall be examined for exact location of fixtures and equipment. Where they are not definitely located, this information shall be obtained from the Owner or authorized representative.
  2. Surveys and Measurements:
    - a. Before submitting bid, visit site, become familiar with conditions under which work will be installed. Contractor will be held responsible for assumptions, omissions, and errors made as a result of failure to become familiar with site and contract documents.
    - b. Base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with established lines and levels. Verify all measurements at site and check the correctness of same.
    - c. Notify the Engineer promptly of discrepancies between actual measurements and those indicated, which prevents following good practice or intent of drawings and specifications. Do not proceed with work until Contractor has received instructions from Engineer.
- B. Labor:

1. Cooperation with Other Trades:
  - a. Give full cooperation to other trades; furnish in writing to General Contractor, with copies to the Engineer, information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.
  - b. Where work will be installed in close proximity to, or will interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment. If directed by the Engineer, prepare composite working drawings and sections at a suitable scale not less than  $1/4" = 1'0"$ , clearly showing how work is to be installed in relation to the work of other trades. If work under this division is installed before coordinating with other trades, or to cause any interference with work of other trades, make necessary changes to correct the condition without additional cost.
  - c. Furnish to other trades all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.
2. Materials & Workmanship:
  - a. Materials and apparatus required for the work shall be new and of first class quality. Furnished, delivered, erected, connected and finished in every detail. Select and arrange to fit properly into the building spaces. Where no specific kind or quality of material is given, furnish first class standard article as accepted by Engineer.
  - b. Furnish the services of an experienced superintendent who shall be in constant charge of the work, together with skilled craftsmen and labor required to unload, transfer, erect, connect-up, adjust, start, operate, and test each system.
  - c. All equipment and materials to be installed with the acceptance of the Engineer in accordance with the recommendations of the manufacturer. This includes the performance of such test as the manufacturer recommends.
3. Protection of Materials:
  - a. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
  - b. Welding: Before any welding is performed, submit a copy of the Welding Procedure Specification (WPS) together with the Procedure Qualification Record as required by Section IX of the ASME Boiler and Pressure Vessel Code.
    - 1) Before any welder performs any welding, submit a copy of the Manufacturer's Record of Welder or Welding Operator Qualification Tests as required by Section IX of the ASME Boiler and Pressure

Vessel Code. The letter or symbol (as shown on the qualification test form) shall be used to identify the work of that welder and shall be affixed, in accordance with appropriate construction code, to each completed weld.

- 2) The types and extent of non-destructive examinations required for pipe welds are shown in Table 136.4 of the Code for Pressure Piping, ASNI/ASME B31.1.

- c. Manufacturer's Recommendations: 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 the 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.

#### 1.6 PERMITS, FEES, & INSPECTIONS

- A. Give all necessary notices, obtain and pay for all permits, and pay all government sales taxes, fees, and other costs, including utility connections or extensions in connection with work. File necessary approvals of governmental departments having jurisdiction. Obtain required certificates of inspection for work and deliver a copy to the Owner or his authorized representative before requesting acceptance for final payment.

#### 1.7 SCHEDULE & SEQUENCE

- A. Temporary Services:
  1. Refer to the General Conditions and Special Conditions for a full description of the temporary services to be provided.
- B. Temporary Openings:
  1. Ascertain from examination of the drawings any special temporary openings in the building required for the admission of apparatus provided under this Division. Notify the Owner accordingly. Contractor shall assume all costs of providing such openings thereafter.
- C. Sequencing:
  1. Contractor shall coordinate sequence of work with owner's representative.

#### 1.8 PROJECT & SITE CONDITIONS

- A. Cutting, Patching, and Firestopping:

1. Furnish all cutting, drilling and patching. Furnish sketches showing the locations and sizes of openings, chases, etc., required for the installation of work. Furnish the Contractor with an approximation of the number and size of openings, chases, etc., required.
- B. Waterproofing:
  1. Where any work pierces existing waterproofing, re-waterproof. The method of installation to be reviewed by Owner or his authorized representative before work is done. Furnish all sleeves, caulking, and flashing required to make openings watertight.
- C. Fireproofing:
  1. Where any work penetrates a fire rated assembly, provide UL listed, firestopping with hourly rating equal to that of the penetrated assembly. Fireproofing shall be compatible with the pipe or equipment doing the penetration so that fire rating of the assembly is maintained.

#### 1.9 DELIVERY, STORAGE, & HANDLING

- A. Delivery & Receipt:
  1. Contractor is responsible for the delivery and storage of all materials, parts, equipment, etc. required for this project.
- B. Storage:
  1. The Contractor shall store all material, parts, and equipment required for this project in accordance with supplier's and manufacturer's recommendations, and Owner's requirements.
- C. Handling, Hoisting, Rigging, & Scaffolding:
  1. Furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished under this Division. Remove same from premises when no longer required.

#### 1.10 RECORD DOCUMENTS

- A. Maintain at the job site a record set of drawings on which any changes in location of equipment, piping, ducts, valves, cleanouts, panels, and major conduits shall be

recorded. These shall be clearly marked on a clean set of prints at the completion of work for record drawings and turned over to the Owner.

- B. Prepare record documents in accordance with the requirements below:
1. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, tanks, etc.). Valve location diagrams, complete with valve tag chart.
  2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
  3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
  4. Contract Modifications, actual equipment and materials installed.

#### 1.11 OPERATION & MAINTENANCE MANUALS FOR MECHANICAL SYSTEMS

- A. Bind Operation & Maintenance Manual for Mechanical System in a hard-backed binder. Spine of each binder shall have the following lettering done in typeset:

OPERATION  
AND  
MAINTENANCE  
MANUAL  
for  
TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET  
VOLUNTOWN, CT

1. Provide a master index at beginning of Manual showing items included. Use plastic tab indexes for sections of Manual.
2. First section shall consist of name, address, and phone number of Architect, Mechanical & Electrical Engineers, General Contractor and Mechanical, Plumbing, Sheet Metal, Refrigeration, Temperature Control & Electrical Contractors. Also include a complete list of equipment installed with name, address, and phone number of vendor.
3. Provide section for each type of item of equipment.
4. Submit three copies of Operation & Maintenance Manual to Engineer for his approval. Use one of these approved copies during final inspection and leave with building maintenance personnel.

- B. Include descriptive literature (Manufacturer's catalog data) of each manufactured item. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
- C. Operating instructions shall include:
  - 1. General description of each mechanical system.
  - 2. Step by step procedure to follow in putting each piece of mechanical equipment into operation.
  - 3. Provide schematic control diagrams for each separate fan system, refrigeration system, heating system, control panel, etc. Each diagram shall show locations of start-stop switches, insertion thermostats, room thermostats, thermometers, firestats, pressure gauges, automatic valves, and refrigeration accessories. Mark correct operating setting for each control instrument on these diagrams.
  - 4. Provide diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlock, electrical switches, and relays.
  - 5. Provide drawing of each temperature control panel system.
- D. Prepare maintenance manuals to include the following information for equipment items:
  - 1. Manufacturer's maintenance equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers & lists, operation instructions of equipment and maintenance & lubrication instructions.
  - 2. Summary list of mechanical equipment requiring lubrication showing name of equipment, location and type, and frequency of lubrication.
  - 3. List of mechanical equipment used indicating name, model, serial number, and name plate data of each item together with number and name associated with each system item.
  - 4. List spare parts and quantities to be maintained in ready inventory at project site.
  - 5. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
  - 6. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
  - 7. Servicing instructions and lubrication charts and schedules.
- E. Air Balance and Water Balance Test Run Reports

**1.12 WARRANTIES AND GUARANTIES**

- A. Guarantee all material and workmanship under this Division for a period of one year, from the date of final acceptance by the Owner.
- B. During guarantee period, all defects developing through materials and/or workmanship shall be replaced immediately without expense to the owner. Make such repairs or replacements to the satisfaction of the Owner.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. As specified under other related sections.
- B. As specified on drawings.

### 2.2 MATERIALS

- A. As specified under other related sections.
- B. As specified on drawings.

### 2.3 EQUIPMENT DEVIATIONS

- A. Where the Contractor proposed to use an item of equipment other than that specified or detailed on the drawings which requires the redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical layout, all such redesign, and all new drawings and detailing required therefore, shall be prepared at the Contractor's expense and are subject to the review and approval of the Engineer. Owner reserves the right to have the Engineer prepare any redesign work.
- B. Where such accepted deviation requires a different quantity and arrangement of materials or equipment from that specified or indicated on the drawings, the Contractor will provide additional equipment and materials required at no additional cost to the Owner.
- C. When equipment or methods deviate from original plans or specifications, the Contractor must submit a written request to deviate to the Engineer. At a minimum the request will address the following:
  - equipment which is different than specified
  - name and data related to the proposed deviation
  - reason for deviation
  - advantageous or disadvantageous to the Owner
  - credit or increase in cost to the Owner

- guarantees or warranties offered (if any)
- acceptance of liability for equivalent performance.

## **2.4 MANUFACTURER'S IDENTIFICATION**

- A. Attach manufacturer's nameplate, name, trademark and address permanently to equipment and material furnished under this Division. Nameplate of a Contractor or Distributor is not acceptable.

## **2.5 ELECTRICAL REQUIREMENTS**

A. Motors:

1. Electric motors furnished as a component part of equipment furnished under this Division shall conform to the requirements of IEEE, NEMA, UL, ANSI C50, and ANSI CI. Motors to be suitable for required load, duty voltage, phase, frequency, service and location.
2. Motors to be suitable for continuous duty at rated horsepower with temperature rise not to exceed 40oC for dripproof motors, 50oC for splashproof motors, and 55oC for totally enclosed motors. Motors to be capable of withstanding momentary overloads of 25 percent without injurious overheating.
3. Motors to have nameplates giving Manufacturer's name, serial number, horsepower, speed and current characteristics.
4. Motor leads shall be permanently identified and supplied with connectors.
5. Each motor to be selected for quiet operation in accordance with NEMA standards.

B. Motor Starters:

1. Electric motor starters shall conform to requirements of IEEE, NEMA, UL, ANSI, CI and shall be suitable for the required load, duty, voltage, phase, frequency, service, and location.
2. When interlocking or automatic control of single phase motors is required, motors to be furnished with full voltage, across-the-line starters.

C. Connections:

1. All wiring to be furnished and installed under Division 16.
2. Power wiring to be furnished and installed complete from power source to motor or equipment junction box, including power wiring through the starters. Starters not factory mounted on equipment shall be furnished and installed under Division 16.

## **2.6 MECHANICAL REQUIREMENTS**



**A. Bases & Supports:**

1. Provide necessary foundations, supports, pads, bases and piers required for equipment, tanks, and other equipment furnished under this Division. Submit drawings to Engineer for review before purchase, fabrication, or construction.
2. Construction of foundations, supports, pads, bases, and piers where mounted on the floor to be of the same materials and same quality of finish as the adjacent surrounding flooring material.

**B. Lubrication:**

1. Lubricate all equipment having moving parts and requiring lubrication according to manufacturer's recommendations prior to testing and operation. Equipment discovered to have been operated before lubrication is subject to rejection and replacement at no cost to the Owner.

**C. Accessibility:**

1. Be responsible for the sufficiency of the size of shafts and chases, adequate clearance in double partitions and hung ceilings for proper installation of work. Cooperate with the Contractor and other contractors whose work is in the same space. Advise the Contractor of requirements. Such spaces and clearances shall be kept to the minimum size required.
2. Locate all equipment which requires servicing in fully accessible positions. Equipment shall include but not be limited to, valves, traps, clean-outs, motors, controllers, switchgear, and drain points. Any change shall be submitted to the Owner or his authorized representative for review.

**D. Connection to Existing Structures:**

1. Before cutting, drilling, attaching, or any work involving building elements, coordinate work with others and Owner to avoid damage to building elements.

**2.7 FIRESTOPPING**

- A. Firestopping shall be UL listed, and tested in accordance with ASTM E814, E119, and E84.
- B. Hourly rating shall be equal to that of the assembly being penetrated.
- C. Firestopping shall be compatible with pipe or equipment penetrating the assembly fire rating of the assembly must be maintained.

**PART 3 - EXECUTION**

**3.1 ROUGH-IN**

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

**3.2 MECHANICAL INSTALLATIONS**

- A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
  - 1. Coordinate mechanical systems, equipment, and materials installation with other building components.
  - 2. Verify all dimensions by field measurements.
  - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
  - 4. Coordinate the installation of required supporting devices and sleeves to be set in structural components, as they are constructed.
  - 5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work.
  - 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
  - 7. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
  - 8. Install systems, materials, and equipment to conform with approved submittal data, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.
  - 9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
  - 10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
  - 11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

### 3.3 CUTTING, PATCHING, AND FIRESTOPPING

- A. General: Perform cutting and patching in accordance with the following requirements apply:
  - 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
  - 1. Remove and replace defective Work.
  - 2. Remove and replace Work not conforming to requirements of the Contract Documents.
  - 3. Remove samples of installed Work as specified for testing.
  - 4. Install equipment and materials in existing structures.
  - 5. Upon written instructions from the Engineer, uncover and restore Work to provide for Engineer observation of concealed Work.
- C. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the Work.
- D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
  - 1. Patch finished surfaces and building components using materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
- E. Firestop all pipe, ductwork and equipment that penetrates fire rated assembly. Follow manufacturer's instructions to provide fire rating equal to that of the assembly.

### 3.4 FIELD QUALITY CONTROL

- A. Perform field tests as specified under other sections.
- B. Arrange for local inspection authorities to inspect work performed prior to burial, closing-in behind wall and above ceiling or encase in concrete. Also arrange for final inspection of work and obtain Final Inspection Certificate before final inspection by Owner or his representative.

**3.5 PAINTING**

- A. See Division 9 for painting in finished areas.
- B. Materials shipped to the job site under this Division to have prime coat and standard manufacturer's finish.

**3.6 TESTING & BALANCING: See Section 15990**

**3.7 EQUIPMENT IDENTIFICATION**

- A. Labeling:
  - 1. All major equipment shall be labeled using black laminate with white letters.

**3.8 CLEANING**

- A. Any part of a system stopped by foreign matter after being placed in operation, to be disconnected, cleaned, and reconnected to locate and remove obstructions. Work damaged in the course of removing obstructions will be repaired or replaced at no additional cost to the Owner.
- B. Cap all pipes to protect against entrance of foreign matter.
- C. Remove rubbish, debris, and excess materials. Remove oil and grease stains on floor areas.

END OF SECTION 15010

**SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General Conditions apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following basic mechanical materials and methods to complement other Division 15 Sections.
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Concrete equipment base construction requirements.
  - 3. Equipment nameplate data requirements.
  - 4. Nonshrink grout for equipment installations.
  - 5. Field-fabricated metal and wood equipment supports.
  - 6. Installation requirements common to equipment specification sections.
  - 7. Cutting and patching.
  - 8. Touch-up painting and finishing.
- B. Pipe and pipe fitting materials are specified in piping system Sections.

**1.3 DEFINITIONS**

- A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.
- B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- F. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

#### 1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract.
- B. Product data for following piping specialties:
  - 1. Mechanical sleeve seals.
  - 2. Identification materials and devices.
- C. Samples of color, lettering style, and other graphic representation required for each identification material and device.
- D. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- E. Coordination drawings for access panel and door locations.
- F. Prepare coordination drawings to a 1/4 inch equals 1 foot scale or larger. Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of the Work. Include the following:
  - 1. Proposed locations of piping, ductwork, equipment, and materials. Include the following:
    - a. Planned piping layout, including valve and specialty locations and valve stem movement.
    - b. Planned duct systems layout, including elbows radii and duct accessories.
    - c. Clearances for installing and maintaining insulation.
    - d. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
    - e. Equipment service connections and support details.
    - f. Exterior wall and foundation penetrations.
    - g. Fire-rated wall and floor penetrations.
    - h. Sizes and location of required concrete pads and bases.
  - 2. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
  - 3. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
  - 4. Reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

- G. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" Article of this Section.

#### **1.5. QUALITY ASSURANCE**

- A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code - Steel."
- B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
  - 1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."
  - 2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.
- C. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- D. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

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

#### **1.7 SEQUENCING AND SCHEDULING**

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

- C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.
- G. Coordinate installation of identifying devices after completion of covering and painting, where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

## **PART 2 - PRODUCTS**

### **2.1 PIPE AND PIPE FITTINGS**

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

### **2.2 JOINING MATERIALS**

- A. Refer to individual piping system specification Sections in Division 15 for special joining materials not listed below.
- B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, except where thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.
  - 2. ASME B16.20 for grooved, ring-joint, steel flanges.
  - 3. AWWA C110, rubber, flat face, 1/8-inch thick, except where other thickness is indicated; and full-face or ring type, except where type is indicated.



- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.
- D. Plastic Pipe Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, except where other type or material is indicated.
- E. Solder Filler Metal: ASTM B 32.
  - 1. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent), having 0.10-percent lead content.
  - 2. Alloy Sn50: Tin (50 percent) and lead (50 percent).
  - 3. Alloy E: Tin (approximately 95 percent) and copper (approximately 5 percent), having 0.10-percent maximum lead content.
  - 4. Alloy HA: Tin-antimony-silver-copper-zinc, having 0.10-percent maximum lead content.
  - 5. Alloy HB: Tin-antimony-silver-copper-nickel, having 0.10-percent maximum lead content.
  - 6. Alloy Sb5: Tin (95 percent) and antimony (5 percent), having 0.20-percent maximum lead content.
- F. Brazing Filler Metals: AWS A5.8.
  - 1. BCuP Series: Copper-phosphorus alloys.
  - 2. BAg1: Silver alloy.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements: Manufacturer's standard solvents complying with the following:
  - 1. Acrylonitrile-Butadiene-Styrene (ABS): ASTM D 2235.
  - 2. Chlorinated Poly(Vinyl Chloride) (CPVC): ASTM F 493.
  - 3. Poly(Vinyl Chloride) (PVC): ASTM D 2564.
  - 4. PVC to ABS Transition: Made to requirements of ASTM D 3138, color other than orange.
- I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.
- J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon steel bolts and nuts.
- K. Couplings: Iron body sleeve assembly, fabricated to match outside diameters of plain-end, pressure pipes.
  - 1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47, Grade 32510 or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

### 2.3 PIPING SPECIALTIES

- A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type, where required to conceal protruding fittings and sleeves.
1. Inside Diameter: Closely fit around pipe, tube, and insulation of insulated piping.
  2. Outside Diameter: Completely cover opening.
  3. Cast Brass: One-piece, with set-screw.
    - a. Finish: Rough brass.
    - b. Finish: Polished chrome plate.
  4. Cast Brass: Split casting, with concealed hinge and set-screw.
    - a. Finish: Rough brass.
    - b. Finish: Polished chrome plate.
  5. Stamped Steel: One-piece, with set-screw and chrome plated finish.
  6. Stamped Steel: One-piece, with spring clips and chrome plated finish.
  7. Stamped Steel: Split plate, with concealed hinge, set-screw, and chrome plated finish.
  8. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome plated finish.
  9. Stamped Steel: Split plate, with exposed-rivet hinge, set-screw, and chrome plated finish.
  10. Stamped Steel: Split plate, with exposed-rivet hinge, spring clips, and chrome plated finish.
  11. Cast-Iron Floor Plate: One-piece casting.
- B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.
  2. Insulating Material: Suitable for system fluid, pressure, and temperature.
  3. Dielectric Unions: Factory-fabricated, union assembly, for 250 psig minimum working pressure at 180 deg F temperature.
  4. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum pressure to suit system pressures.
  5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic

gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

- a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.
6. Dielectric Couplings: Galvanized-steel coupling, having inert and non-corrosive, thermoplastic lining, with threaded ends and 300 psig minimum working pressure at 225 deg F temperature.
7. Dielectric Nipples: Electroplated steel nipple, having inert and non-corrosive, thermoplastic lining, with combination of plain, threaded, or grooved end types and 300 psig working pressure at 225 deg F temperature.
- C. Mechanical Sleeve Seals: Modular, watertight, mechanical type. Components include interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve. Connecting bolts and pressure plates cause rubber sealing elements to expand when tightened.
- D. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
  1. Steel Sheet-Metal: 24 gage or heavier, galvanized sheet metal, round tube closed with welded longitudinal joint.
  2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
  3. Cast-Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, having plain ends and integral water stop, except where other features are specified.
  4. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets, and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.
    - a. Penetrating Pipe Deflection: 5 percent without leakage.
    - b. Housing: Ductile-iron casting having waterstop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111, of housing and gasket size as required to fit penetrating pipe.
    - c. Pipe Sleeve: AWWA C151, ductile-iron pipe.
    - d. Housing-to-Sleeve Gasket: Rubber or neoprene, push-on type, of manufacturer's design.
  5. Cast-Iron Sleeve Fittings: Commercially-made, sleeve having integral clamping flange, with clamping ring, bolts, and nuts for membrane flashing.
    - a. Underdeck Clamp: Clamping ring with set-screws.
  6. PVC Plastic: Manufactured, permanent, with nailing flange for attaching to wooden forms.

7. PE Plastic: Manufactured, reusable, tapered, cup-shaped, smooth outer surface, with nailing flange for attaching to wooden forms.

## **2.4 IDENTIFYING DEVICES AND LABELS**

- A. General: 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 listed application, selection is Installer's option, but provide single selection for each product category.
- B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.
  1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
  2. Location: An accessible and visible location.
- C. Stencils: Standard stencils, prepared for required applications with letter sizes conforming to recommendations of ASME A13.1 for piping and similar applications, but not less than 1-1/4-inches-high letters for ductwork and not less than 3/4-inch-high letters for access door signs and similar operational instructions.
  1. Material: Fiberboard.
  2. Material: Brass.
  3. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.
  4. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ASME A13.1 for colors.
- D. Snap-On Plastic Pipe Markers: Manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, conforming to ASME A13.1.
- E. Pressure-Sensitive Pipe Markers: Manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, conforming to ASME A13.1.
- F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white (letter color) melamine subcore, except when other colors are indicated.
  1. Fabricate in sizes required for message.
  2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.

3. Punch for mechanical fastening.
  4. Thickness: 1/16 inch, except as otherwise indicated.
  5. Thickness: 1/8 inch, except as otherwise indicated.
  6. Thickness: 1/16 inch, for units up to 20 square inches or 8-inches long; 1/8 inch for larger units.
  7. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
- G. Plastic Equipment Markers: Laminated-plastic, color-coded equipment markers. Conform to following color code:
1. Yellow: Heating equipment and components.
  2. Brown: Energy reclamation equipment and components.
  3. Blue: Equipment and components that do not meet any of above criteria.
  4. For hazardous equipment, use colors and designs recommended by ASME A13.1.
  5. Nomenclature: Include following, matching terminology on schedules as closely as possible:
    - a. Name and plan number.
    - b. Equipment service.
    - c. Design capacity.
    - d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.
  6. Size: Approximate 2-1/2 by 4 inches for control devices, dampers, and valves; and 4-1/2 by 6 inches for equipment.
- H. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.
1. Multiple Systems: Where multiple systems of same generic name are indicated, provide identification that indicates individual system number as well as service such as "Boiler No. 3," "Air Supply No. 1H," or "Standpipe F12."

## **2.5 GROUT**

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  2. Design Mix: 5000 psi, 28-day compressive strength.
  3. Packaging: Premixed and factory-packaged.

**PART 3 - EXECUTION**

**3.1 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. General: Install piping VALVES as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 15 specify piping installation requirements unique to the piping system.
- B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Install piping as indicated, except where deviations to layout are approved on coordination drawings.
- C. Install piping at indicated slope.
- D. Install components having pressure rating equal to or greater than system operating pressure.
- E. Install piping free of sags and bends.
- F. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.
- G. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- H. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- I. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- J. Install fittings for changes in direction and branch connections.
- K. Install couplings according to manufacturer's printed instructions.
- L. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
  - 1. Chrome-Plated Piping: Cast-brass, one-piece, with set-screw, and polished chrome-plated finish. Use split-casting escutcheons where required, for existing piping.
  - 2. Uninsulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with set-screw.
  - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.

4. Insulated Piping: Cast-brass or stamped-steel, with concealed hinge, spring clips, and chrome-plated finish.
  5. Piping in Utility Areas: Cast-brass or stamped-steel, with set-screw or spring clips.
- M. Sleeves are not required for core drilled holes.
- N. Permanent sleeves are not required for holes formed by PE plastic (removable) sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs, and where indicated.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, concrete floor and roof slabs, and where indicated.
1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.
  2. Build sleeves into new walls and slabs as work progresses.
  3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. PVC Pipe Sleeves: For pipes smaller than 6 inches.
    - b. Steel Pipe Sleeves: For pipes smaller than 6 inches.
    - c. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger, penetrating gypsum-board partitions.
    - d. Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Flashing is specified in Division 16 Section "Basic Electrical Materials and Methods."
    - e. Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
  4. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants specified in Division 7 Section "Joint Sealants."
- Q. Above Grade, Exterior Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.
1. Install steel pipe for sleeves smaller than 6 inches.
  2. Install cast-iron "wall pipes" for sleeves 6 inches and larger.
  3. Assemble and install mechanical seals according to manufacturer's printed instructions.

- R. Below Grade, Exterior Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.
- S. Below Grade, Exterior Wall, Pipe Penetrations: Install ductile-iron wall penetration system sleeves according to manufacturer's printed installation instructions.
- T. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping sealant material.
- U. Verify final equipment locations for roughing-in.
- V. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- W. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system specification Sections.
  - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  - 3. Soldered Joints: Construct joints according to AWS "Soldering Manual," Chapter 22 "The Soldering of Pipe and Tube."
  - 4. Brazed Joints: Construct joints according to AWS "Brazing Manual," Chapter 28 "Pipe and Tube."
  - 5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:
    - a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    - b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).
    - c. Align threads at point of assembly.
    - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    - e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.



6. Welded Joints: Construct joints according to AWS D10.12 "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe" using qualified processes and welding operators according to "Quality Assurance" Article.
7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
8. Plastic Pipe and Fitting Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following standards:
  - a. Comply with ASTM F 402 for safe handling practice of solvent-cement and primers.
  - b. Acrylonitrile-Butadiene-Styrene (ABS): ASTM D 2235 and ASTM D 2661.
  - c. Chlorinated Poly(Vinyl Chloride) (CPVC): ASTM D 2846 and ASTM F 493.
  - d. Poly(Vinyl Chloride) (PVC) Pressure Application: ASTM D 2672.
  - e. Poly(Vinyl Chloride) (PVC) Non-Pressure Application: ASTM D 2855.
  - f. PVC to ABS (Non-Pressure) Transition: Procedure and solvent cement described in ASTM D 3138.
9. Plastic Pipe and Fitting Heat-Fusion Joints: Prepare pipe and fittings and join with heat-fusion equipment, according to manufacturer's printed instructions.
  - a. Plain-End Pipe and Fittings: Butt joining.
  - b. Plain-End Pipe and Socket-Type Fittings: Socket-joining.
- X. Piping Connections: Except as otherwise indicated make piping connections as specified below.
  1. Install unions, in piping 2 inches and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inches or smaller threaded pipe connection.
  2. Install flanges, in piping 2-1/2-inches and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
  3. Dry Piping Systems (Gas, Compressed Air, and Vacuum): Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems (Water and Steam): Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide the maximum possible headroom, where mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Engineer.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.
- D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
- E. Install equipment giving right-of-way to piping systems installed at a required slope.

### **3.3 LABELING AND IDENTIFYING**

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
  - 1. Stenciled Markers: Complying with ASME A13.1.
  - 2. Plastic markers, with application systems. Install on pipe insulation segment where required for hot non-insulated pipes.
  - 3. Locate pipe markers as follows wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
    - a. Near each valve and control device.
    - b. Near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
    - c. Near locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.
    - d. At access doors, manholes, and similar access points that permit view of concealed piping.
    - e. Near major equipment items and other points of origination and termination.
    - f. Spaced at a maximum of 50 feet intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
    - g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.
- B. Equipment: Install engraved plastic laminate sign or equipment marker on or near each major item of mechanical equipment.

1. Lettering Size: Minimum 1/4-inch-high lettering for name of unit where viewing distance is less than 2 feet, 1/2-inch-high for distances up to 6 feet, and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.
  2. Text of Signs: Provide text to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to name of identified unit.
- C. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows, showing duct system service and direction of flow.
1. Location: In each space where ducts are exposed or concealed by removable ceiling system, locate signs near points where ducts enter into space and at maximum intervals of 50 feet.
- D. Adjusting: Relocate identifying devices which become visually blocked by work of this Division or other Divisions.

### 3.4 PAINTING AND FINISHING

- A. Damage and Touch-Up: Repair marred and damaged factory painted finishes with materials and procedures to match original factory finish.

### 3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

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

### 3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

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

### 3.7 CUTTING AND PATCHING

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT      BASIC MECHANICAL MATERIALS AND METHODS      15050-16**

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

END OF SECTION 15050

**SECTION 15100 - VALVES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.
- B. Requirements of the following Division 15 Sections apply to this section:
  - 1. "Basic Mechanical Requirements."
  - 2. "Basic Piping Materials and Methods."

**1.2 SUMMARY**

- A. This Section includes general duty valves common to most mechanical piping systems.
  - 1. Special purpose valves are specified in individual piping system specifications.

**1.3 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

**1.4 QUALITY ASSURANCE**

- A. Single Source Responsibility: Comply with the requirements specified in Division 1 Section "MATERIALS AND EQUIPMENT."
- B. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
- C. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the various MSS Standard Practices referenced.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Preparation For Transport: Prepare valves for shipping as follows:

1. Ensure valves are dry and internally protected against rust and corrosion.
  2. Protect valve ends against damage to threads, flange faces, and weld-end preps.
  3. Set valves in best position for handling. Set globe and gate valves closed to prevent rattling; set ball and plug valves open to minimize exposure of functional surfaces; set butterfly valves closed or slightly open; and block swing check valves in either closed or open position.
- B. Storage: Use the following precautions during storage:
1. Do not remove valve end protectors unless necessary for inspection; then reinstall for storage.
  2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement in watertight enclosures.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to:
1. Grinell
  2. Jenkins
  3. Nibco
  4. Powell
  5. Stockham

### 2.2 VALVE FEATURES, GENERAL

- A. Valve Design: Rising stem or rising outside screw and yoke stems as indicated.
1. Nonrising stem valves may be used where indicated.
- B. Pressure and Temperature Ratings: As required to suit system pressures and temperatures.
- C. Sizes: Same size as upstream pipe, unless otherwise indicated.
- D. Operators: Provide the following special operator features:
1. Handwheels, fastened to valve stem, for valves other than quarter turn.
  2. Lever handles, on quarter-turn valves 6-inch and smaller, except for plug valves.

- E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
- G. End Connections: As indicated in the valve specifications.
  - 1. Threads: Comply with ANSI B1.20.1.
  - 2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
  - 3. Solder-Joint: Comply with ANSI B16.18.
    - a. Caution: Where soldered end connections are used, use solder having a melting point below 840 deg F for gate, globe, and check valves; below 421 deg F for ball valves.

## **2.3 GATE VALVES**

- A. Gate Valves, 2-Inch and Smaller: MSS SP-80; Class 125, body and bonnet of ASTM B 62 cast bronze; with threaded or solder ends, solid disc, copper-silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel. Provide Class 150 valves meeting the above where system pressure requires.
- B. Gate Valves, 2-1/2-Inch and Larger: MSS SP-70; Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A 126 Class B; with flanged ends, "Teflon" impregnated packing, and two-piece backing gland assembly.

## **2.4 BALL VALVES**

- A. Ball Valves, 1 Inch and Smaller: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; two-piece construction; with bronze body conforming to ASTM B 62, standard (or regular) port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold water service; threaded ends for heating hot water.
- B. Ball Valves, 1-1/4-Inch to 2-Inch: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; 3-piece construction; with bronze body conforming to ASTM B 62, conventional port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold water service; threaded ends for heating hot water.

## **2.5 PLUG VALVES**

- A. Plug Valves, 2-Inch and Smaller: Rated at 150 psi WOG; bronze body, with straightaway pattern, square head, and threaded ends.
- B. Plug Valves, 2-1/2-Inch and Larger: MSS SP-78; rated at 175 psi WOG; lubricated plug type, with semisteel body, single gland, wrench operated, and flanged ends.

## **2.6 GLOBE VALVES**

- A. Globe Valves, 2-Inch and Smaller: MSS SP-80; Class 125; body and screwed bonnet of ASTM B 62 cast bronze; with threaded or solder ends, brass or replaceable composition disc, copper-silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel. Provide Class 150 valves meeting the above where system pressure requires.
- B. Globe Valves, 2-1/2-Inch and Larger: MSS SP-85; Class 125 iron body and bolted bonnet conforming to ASTM A 126, Class B; with outside screw and yoke, bronze mounted, flanged ends, and "Teflon" impregnated packing, and two-piece backing gland assembly.

## **2.7 BUTTERFLY VALVES**

- A. Butterfly Valves, 2-1/2-Inch and Larger: MSS SP-67; rated at 200 psi; cast-iron body conforming to ASTM A 126, Class B. Provide valves with field replaceable EPDM sleeve, nickel-plated ductile iron disc (except aluminum bronze disc for valves installed in condenser water piping), stainless steel stem, and EPDM O-ring stem seals. Provide lever operators with locks.

## **2.8 CHECK VALVES**

- A. Swing Check Valves, 2-Inch and Smaller: MSS SP-80; Class 125, cast-bronze body and cap conforming to ASTM B 62; with horizontal swing, Y-pattern, and bronze disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line. Provide Class 150 valves meeting the above specifications, with threaded end connections, where system pressure requires or where Class 125 valves are not available.
- B. Swing Check Valves, 2-1/2-Inch and Larger: MSS SP-71; Class 125 cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, and bronze disc or cast-iron disc with bronze disc ring; and flanged ends. Provide valves capable of being refitted while the valve remains in the line.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**



- A. Examine valve interior through the end ports for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks used to prevent disc movement during shipping and handling.
- B. Actuate valve through an open-close and close-open cycle. Examine functionally significant features, such as guides and seats made accessible by such actuation. Following examination, return the valve closure member to the shipping position.
- C. Examine threads on both the valve and the mating pipe for form (i.e., out-of-round or local indentation) and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.
- E. Prior to valve installation, examine the piping for cleanliness, freedom from foreign materials, and proper alignment.
- F. Replace defective valves with new valves.

### **3.2 VALVE ENDS SELECTION**

- A. Select valves with the following ends or types of pipe/tube connections:
  - 1. Copper Tube Size, 2-Inch and Smaller: Solder ends, except provide threaded ends for heating hot water and low-pressure steam service.
  - 2. Steel Pipe Sizes, 2-Inch and Smaller: threaded ends.
  - 3. Steel Pipe Sizes 2-1/2 Inch and Larger: flanged ends.

### **3.3 VALVE INSTALLATIONS**

- A. General Application: Use gate, ball, and butterfly valves as indicated.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.
- D. Install valves in horizontal piping with stem at the center of the pipe.
- E. Install valves in a position to allow full stem movement.
- F. Installation of Check Valves: Install for proper direction of flow as follows:
  - 1. Swing Check Valves: Horizontal position with hinge pin level.

### **3.4 SOLDER CONNECTIONS**

- A. Cut tube square and to exact lengths.
- B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket in same manner.
- C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.
- D. Open gate and globe valves to full open position.
- E. Remove the cap and disc holder of swing check valves having composition discs.
- F. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of the flux.
- G. Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

### **3.5 THREADED CONNECTIONS**

- A. Note the internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
- B. Align threads at point of assembly.
- C. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).
- D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

### **3.6 FLANGED CONNECTIONS**

- A. Align flange surfaces parallel.
- B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

- C. For dead-end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

**3.7 FIELD QUALITY CONTROL**

- A. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

**3.8 ADJUSTING AND CLEANING**

- A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.

**3.9 VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES**

**VALVES, 2-INCH AND SMALLER**

| SERVICE                     |     | GATE | GLOBE | BALL | CHECK |
|-----------------------------|-----|------|-------|------|-------|
| Domestic Hot and Cold Water | 125 | 125  | 150   | 125  |       |

**VALVES, 2-1/2-INCH AND LARGER**

| SERVICE                     | GATE | GLOBE | BUTTER-<br>FLY | CHECK |
|-----------------------------|------|-------|----------------|-------|
| Domestic Hot and Cold Water | 125  | 125   | 200            | 125   |

END OF SECTION 15100

**SECTION 15140 – SUPPORTS AND ANCHORS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawing and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Division 15 Sections apply to this section:
  - 1. "Basic Mechanical Requirements."
  - 2. "Basic Piping Materials and Methods."

**1.2 SUMMARY**

- A. This section includes the following:
  - 1. Horizontal-piping hangers and supports.
  - 2. Vertical-piping clamps.
  - 3. Hanger-rod attachments.
  - 4. Building attachments.
  - 5. Saddles and shields.
  - 6. Spring hangers and supports.
  - 7. Miscellaneous materials.
  - 8. Equipment supports.
- B. Related sections: The following sections contain requirements that relate to this section:
  - 1. Division 15 Section "Mechanical Insulation" for pipe insulation.

**1.3 DEFINITIONS**

- A. Terminology used in this section is defined in MSS SP-90.

**1.4 SUBMITTALS**

- A. General: Submit the following in accordance with conditions of contract and Division 1 specification sections.
  - 1. Product data, including installation instructions for each type of support and anchor. Submit pipe hanger and support schedule showing Manufacturer's

- figure number, size, location, and features for each required pipe hanger and support.
2. Product certificates signed by the manufacturer of hangers and supports certifying that their products meet the specified requirements.
  3. Assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly of components.

### 1.5 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."
  1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Regulatory Requirements: Comply with applicable plumbing code pertaining to product materials and installation of supports and anchors.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURED UNITS

- A. Hangers and support components shall be factory fabricated of materials, design, and manufacturer complying with MSS SP-58 and MSS SP-69.
  1. Pipe attachments shall have nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

### 2.2 MISCELLANEOUS MATERIALS

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions under which supports and anchors are to be installed. Do not proceed with installing until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION OF HANGERS AND SUPPORTS

- A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69 and SP-89. Install supports with maximum spacings complying with Boca Plumbing and Mechanical Codes. Where piping of various sizes is supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe as specified above for individual pipe hangers.
- B. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.
- C. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- D. Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
- E. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- F. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ASME B31.9 Building Services Piping Code is not exceeded.
- G. Insulated Piping: Comply with the following installation requirements.
  - 1. Shields: Install protective shields MSS Type 40 on cold water piping that has vapor barrier. Shields shall span an arc of 180 degrees and shall have dimensions in inches not less than the following:

| <u>NPS</u>        | <u>LENGTH</u> | <u>THICKNESS</u> |
|-------------------|---------------|------------------|
| 1/4 THROUGH 3-1/2 | 12            | 0.048            |
| 4                 | 12            | 0.060            |

- 2. Insert material shall be at least as long as the protective shield.
- 3. Thermal Hanger Shields: Install where indicated, with insulation of same thickness as piping.

### 3.3 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe anchors and equipment supports. Install and align fabricated anchors in indicated locations.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and 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. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours welded surfaces to match adjacent contours.

#### **3.4 ADJUSTING**

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION 15140

**SECTION 15190 – MECHANICAL IDENTIFICATION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION OF WORK:**

- A. Identification devices specified in this section include the following:
  - 1. Painted Identification Materials.
  - 2. Plastic Pipe Markers.
  - 3. Plastic Tape.
  - 4. Underground-Type Plastic Line Marker.
  - 5. Plastic Duct Markers.
  - 6. Valve Tags.
  - 7. Valve Schedule Frames.
  - 8. Engraved Plastic-Laminate Signs.
  - 9. Plastic Equipment Markers.
  - 10. Plasticized Tags.
- B. Mechanical identification furnished as part of factory-fabricated equipment, is specified as part of equipment assembly in other Division-15 sections.
- C. Refer to other Division-15 sections for identification requirements at central-station mechanical control center; not work of this section.
- D. Refer to Division-16 sections for identification requirements of electrical work; not work of this section.

**1.2 QUALITY ASSURANCE:**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. 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.

**1.3 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. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule. In addition to mounted copies, furnish extra copies for Maintenance Manuals as specified in Division 1.
- D. 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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering mechanical identification materials:
  - 1. Engineer approved equal.

### **2.1 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.

### **2.2 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.

### **2.3 PLASTIC PIPE MARKERS:**

- A. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1
- B. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1
- C. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125 degrees F (52 degrees C) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
- D. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
  - 1. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
  - 2. Adhesive lap joint in pipe marker overlap.
  - 3. Laminated or bonded application of pipe marker to pipe (or insulation).
  - 4. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".
- E. Large Pipes: For external diameters of 6" and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:
  - 1. Laminated or bonded application of pipe marker to pipe (or insulation).
  - 2. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1-1/2" wide; full circle at both ends of pipe marker, tape lapped 3".
  - 3. Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless steel bands.
- F. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Owner/Owner's Representative in cases of variance with names as shown or specified.
- G. Lettering: Comply with piping system nomenclature as specified, scheduled or shown, and abbreviate only as necessary for each application length.
  - 1. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as a separate unit of plastic.

**2.4 PLASTIC TAPE:**

- A. General: Provide manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.
- B. Width: Provide 1-1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6", 2-1/2" wide tape for larger pipes.
- C. Color: Comply with ANSI A13.1, except where another color selection is indicated.

**2.5 VALVE TAGS:**

- C. Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.
  - 1. Provide 1-1/2" diameter tags, except as otherwise indicated.
  - 2. Provide size and shape as specified or scheduled for each piping system.
  - 3. Fill tag engraving with black enamel.
- D. Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32" thick engraved plastic laminate valve tags, with piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.
  - 1. Provide 1-1/2" sq. black tags with white lettering, except as otherwise indicated.
  - 2. Provide size, shape and color combination as specified or scheduled for each piping system.
- E. Plastic Valve Tags: Provide manufacturer's standard solid plastic valve tags with printed enamel lettering, with piping system abbreviation in approximately 3/16" high letters and sequenced valve numbers approximately 3/8" high, and with 5/32" hole for fastener.
  - 1. Provide 1-1/8" sq. white tags with black lettering.
  - 2. Provide size, shape and color combination as specified or scheduled for each piping system.
- F. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

- G. Access Panel Markers: Provide manufacturer's standard 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve. Include 1/8" center hole to allow attachment.

**2.6 VALVE SCHEDULE FRAMES:**

- A. General: For each page of valve schedule, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

**2.7 ENGRAVED PLASTIC-LAMINATE SIGNS:**

- A. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
- B. Thickness: 1/16", except as otherwise indicated.
- C. Thickness: 1/8", except as otherwise indicated.
- D. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.
- E. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

**2.8 PLASTIC EQUIPMENT MARKERS:**

- A. General: Provide manufacturer's standard laminated plastic, color coded equipment markers. Conform to the following color code:
  - 1. Yellow: Heating equipment and components.
  - 2. Blue: Equipment and components that do not meet any of the above criteria.
  - 3. 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.

**2.9 PLASTICIZED TAGS:**

- A. General: Manufacturer's standard pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matt finish suitable for writing, approximately 3-1/4" x 5-5/8", with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording (as examples; DANGER, CAUTION, DO NOT OPERATE).

**2.10 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.
1. 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 DUCTWORK IDENTIFICATION:**

- A. General: Identify air supply, return, exhaust, intake and relief ductwork with duct markers; or provide stenciled signs and arrows, showing ductwork service and direction of flow, in black or white (whichever provides most contrast with ductwork color).
- B. Location: In each space where ductwork is exposed, or concealed only by removable ceiling system, locate signs near points where ductwork originates or continues into

concealed enclosures (shaft, underground or similar concealment), and at 50' spacings along exposed runs.

- C. Access Doors: Provide duct markers or stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate safety and procedural information.
- D. Concealed Doors: Where access doors are concealed above acoustical ceilings or similar concealment, plasticized tags may be installed for identification in lieu of specified signs, at Installer's option.

### 3.3 PIPING SYSTEM IDENTIFICATION:

- A. General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:
  - 1. Stenciled markers, including color-coded background band or rectangle, and contrasting lettering of black or white. Extend color band or rectangle 2" beyond ends of lettering.
  - 2. Stenciled markers, with lettering color complying with ANSI A13.1.
  - 3. Plastic pipe markers, with application system as indicated under "Materials" in this section. Install on pipe insulation segment where required for hot non-insulated pipes.
  - 4. Stenciled markers, black or white for best contrast, wherever continuous color-coded painting of piping is provided.
- B. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
  - 1. Near each valve and control device.
  - 2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
  - 3. Near locations where pipes pass through walls or floors/ ceilings, or enter non-accessible enclosures.
  - 4. At access doors, manholes and similar access points which permit view of concealed piping.
  - 5. Near major equipment items and other points of origination and termination.
  - 6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
  - 7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

**3.4 VALVE IDENTIFICATION:**

- B. General: Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibs, and shut-off valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.
  - 1. Tagging Schedule: Comply with requirements of "Valve Tagging Schedule" at end of this section.
- C. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.
  - 1. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

**3.5 MECHANICAL EQUIPMENT 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 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. compressors, condensers and similar motor- driven units.
  - 5. Fans, blowers, primary balancing dampers and mixing boxes.
  - 6. Tanks and pressure vessels.
  - 7. Strainers, filters, humidifiers, water treatment systems and similar equipment.
- 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.
- E. Optional Use of Plasticized Tags: At Installer's option, where equipment to be identified is concealed above acoustical ceilings or similar concealment, plasticized tags may be installed within concealed space to reduce amount of text in exposed sign (outside concealment).
  - 1. Operational valves and similar minor equipment items located in non-occupied spaces (including machine rooms) may, at Installer's option, be identified by installation of plasticized tags in lieu of engraved plastic signs.

**3.6 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.

**3.7 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.
  - 1. Where stenciled markers are provided, clean and retain stencils after completion of stenciling and include used stencils in extra stock, along with required stock of stenciling paints and applicators.

END OF SECTION 15190



**SECTION 15250 - MECHANICAL INSULATION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION OF WORK:**

- A. Extent of mechanical insulation required by this section is indicated by requirements of this section.
- B. Types of mechanical insulation specified in this section include the following:
  - 1. Piping Systems Insulation:
    - a. Fiberglass.
    - b. Cellular Glass.
    - c. Calcium Silicate.
    - d. Flexible Unicellular.
  - 2. Ductwork System Insulation:
    - a. Fiberglass.
    - b. Flexible Unicellular.
  - 3. Equipment Insulation:
    - a. Fiberglass.
    - b. Calcium Silicate.
    - c. Cellular.
    - d. Flexible Unicellular.
- C. Refer to Division-15 section "Supports and Anchors" for protection saddles, protection shields, and thermal hanger shields; not work of this section.
- D. Refer to Division-15 section "Mechanical Identification" for installation of identification devices for piping, ductwork, and equipment; not work of this section.

**1.2 QUALITY ASSURANCE:**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar services for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.

- C. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
  - 1. Exception: Outdoor mechanical insulation may have flame spread index of 75 and smoke developed index of 150.
  - 2. Exception: Industrial mechanical insulation that will not affect life safety egress of building may have flame spread index of 75 and smoke developed index of 150.

**1.3 SUBMITTALS:**

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.
- B. Maintenance Data: Submit maintenance data and replacement material lists for each type of mechanical insulation. Include this data and product data in maintenance manual.
- C. Samples: Submit manufacturer's sample of each piping insulation type required, and of each duct and equipment insulation type required. Affix label to sample completely describing product.

**1.4 DELIVERY, STORAGE, AND HANDLING:**

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.
- B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

**PART 2 - PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS:**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
- B. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Certainteed Corp.
2. Knauf
3. Manville Products Corp.
4. Owens-Corning Fiberglas Corp.

**2.2 PIPING INSULATION MATERIALS:**

- A. Fiberglass Piping Insulation: ASTM C 547, Class 1 unless otherwise indicated. \*\*K-factor maximum of 0.25 at 75 degrees F.\*\*
- B. Jackets for Piping Insulation: ASTM C 921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at Installers option.
  1. Encase pipe fittings insulation with one-piece premolded PVC fitting covers, fastened as per manufacturer's recommendations.
  2. Encase exterior piping insulation with aluminum jacket with weather-proof construction.
- C. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.
- D. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

**2.3 DUCTWORK INSULATION MATERIALS:**

- A. Rigid Fiberglass Ductwork Insulation: ASTM C 612, Class 1.
- B. Flexible Fiberglass Ductwork Insulation: ASTM C 553, Type I, Class B-4.
- C. Cellular Glass Ductwork Insulation: ASTM C 552, Type I.
- D. Flexible Unicellular Ductwork Insulation: ASTM C 534, Type II.
- E. Jackets for Ductwork Insulation: ASTM C 921, Type I for ductwork with temperatures below ambient; Type II for ductwork with temperatures above ambient.
- F. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.

- G. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

**2.4 EQUIPMENT INSULATION MATERIALS:**

- A. Rigid Fiberglass Equipment Insulation: ASTM C 612, Class 2.
- B. Flexible Fiberglass Equipment Insulation: ASTM C 553, Type I, Class B-4.
- C. Calcium Silicate Equipment Insulation: ASTM C 533, Type I, Block.
- D. Cellular Glass Equipment Insulation: ASTM C 552, Type I.
- E. Flexible Unicellular Equipment Insulation: ASTM C 534, TYPE II.
- F. Jacketing Material for Equipment Insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option, except as otherwise indicated.
- G. Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
- H. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

**PART 3 - EXECUTION**

**3.1 INSPECTION:**

- A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

**3.2 PLUMBING PIPING SYSTEM INSULATION:**

- A. Insulation Omitted: Omit insulation on chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, strainers, check valves, balance cocks, flow regulators, drain lines from water coolers, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and pre-insulated equipment.
- B. Cold Piping:

1. Application Requirements: Insulate the following cold plumbing piping systems:
    - a. Potable cold water piping.
    - b. Interior above-ground storm water piping.
    - c. Plumbing vents within 6 lineal feet of roof outlet.
  2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
    - a. Fiberglass: Per current IECC.
- C. Hot Piping:
1. Application Requirements: Insulate the following plumbing piping systems:
    - a. Potable hot water piping.
    - b. Potable hot water recirculating piping.
  2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
    - a. Fiberglass: Per current IECC.

**3.3 DUCTWORK SYSTEM INSULATION:**

- A. See contract drawing for extent and type of Internal Accoustical Lining/Insulation.
- B. Insulation Omitted: Do not insulate fibrous glass ductwork, or lined ductwork.
- C. Cold Ductwork (Below Ambient Temperature):
  1. Application Requirements: Insulate the following cold ductwork:
    - a. Outdoor air intake ductwork between air entrance and fan inlet or HVAC unit inlet.
    - b. HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet.
      - 1) Insulate neck and bells of supply diffusers.

- c. HVAC return ductwork between room terminal inlet and return fan inlet, or HVAC unit inlet; except omit insulation on return ductwork located in return air ceiling plenums.
    - d. HVAC plenums and unit housings not pre-insulated at factory or lined.
  - 2. Insulate each ductwork system specified above with one of the following types and thicknesses of insulation:
    - a. Rigid Fiberglass: 1-1/2" thick, increase thickness to 2" in machine, fan and equipment rooms.
    - b. Flexible Fiberglass: 1-1/2" thick, application limited to concealed locations.
    - c. Cellular Glass: 2-1/2" thick.
    - d. Flexible Unicellular: 1" thick.
- B. Hot Ductwork (Above Ambient Temperature):
- 1. Application Requirements: Insulate the following hot ductwork:
    - a. Hot supply and return ductwork between fan discharge, or heating unit discharge, and room terminal outlet; except omit insulation on return ductwork located in return air ceiling plenums.
    - b. Heating plenums and unit housings not pre-insulated at factory or lined.
  - 2. Insulate each ductwork system specified above with one of the following types and thicknesses of insulation:
    - a. Rigid Fiberglass: 2" thick.
    - b. Flexible Fiberglass: 2" thick, application limited to concealed locations.
    - c. Calcium Silicate: 3" thick. Use for range and hood exhaust ductwork, in addition to other applications where indicated.

### 3.5 INSTALLATION OF PIPING INSULATION:

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance of tests.
- C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with a single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

- D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure a complete and tight fit over surfaces to be covered.
- E. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.
- F. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.
- G. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.
- H. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

### 3.3 INSTALLATION OF DUCTWORK INSULATION:

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its indented purpose.
- B. Install insulation materials with smooth and even surfaces.
- C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage,
- E. Extent ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated.
- F. Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where internal insulation or sound absorbing linings have been installed.
- G. Ductwork Exposed to Weather: Protect outdoor insulation from weather by installing outdoor protective finish or jacketing as recommended by manufacturer.

- H. Corner Angles: Except for oven and hood exhaust duct insulation, install corner angles on external corners of insulation on ductwork in exposed finished spaces before covering with jacketing.

**3.8 PROTECTION AND REPLACEMENT:**

- H. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- I. Protection: Insulation Installer shall advise Design Builder of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 15250



**SECTION 15282 – GAS DETECTION SYSTEM**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
1. Provide methane and carbon monoxide gas detection system and monitoring equipment.
  2. Interface with ventilation exhaust system
  3. Interface with mechanical equipment
  4. Interface with fire alarm systems.
  5. Interface with heating/ventilation units.
  6. Interface with operation of overhead doors.
- B. Provide a complete installation of a carbon monoxide (CO) and nitrogen dioxide (NO<sub>2</sub>) gas detection system including stand-alone sensor(s) and audible/visual alarm devices. The system shall include, but not be limited to, the following:
1. Future expandability
  2. Display of combustible gas concentration
  3. Ability to modify alarm set points
  4. Automatic and manual fan start/stop
  6. Display of alarm status

**PART 2 GAS DETECTION**

**2.01 PRODUCTS**

**HONEYWELL DETECTORS E<sup>3</sup>Point Models:**

- 24 VAC/VDC = E3SA + E3SCO + E3SRMNO<sub>2</sub>
- 120 VAC = E3SAH + E3SCO + E3SRMNO<sub>2</sub>
- Engineer approved equal.

- A. Transmitter will be powered by 24 V AC/DC (E3SA) or 120 Vac (E3SAH). The gas transmitter will incorporate a catalytic bead sensor for combustible gases and electrochemical for toxic gases. Unit sensing cell must compensate for variations in relative humidity and temperature to maintain high levels of accuracy.
- B. For local activation of fans or louvers (or other equipment), two on-board DPDT relays 5 A, 30 Vdc or 250 Vac (resistive load) will be activated at programmable set points (and programmable time delays). An LCD display will provide local gas concentration readings.

- C. Transmitter will be capable of operating within relative humidity ranges of 5-95% non-condensing and temperature ranges of -4° F to 104° F (-20° C to 40° C).
- D. Unit will be certified to ANSI/UL 61010-1 label and CAN/CSA-C22.2 No. 61010-1. Transmitter must be manufactured in an ISO 9001-2000 production environment.
- E. The transmitter should have a plug-in capability for a gas cartridge with a smart sensor capable of self-testing.
- F. For local activation of audible alarms, the transmitter shall have an on-board device able to generate an audible output of 85 dBA @ 10 ft (3m).

Detector alarm levels are to be activated and the unit is to be installed in accordance with the following parameters:

| <b>TOXIC GASES</b>   | <b>1st ALARM<br/>SET POINT<br/>(TLV-TWA)</b> | <b>2nd ALARM<br/>SET POINT<br/>(TLV-STEL)</b> | <b>MOUNTING<br/>HEIGHT</b> | <b>COVERAGE<br/>RADIUS</b> |
|----------------------|--|---|----------------------------|----------------------------|
| Carbon Monoxide (CO) | 25 ppm                                       | 200 ppm                                       | 5 ft above finished floor  | 50 ft                      |
| Nitrogen Dioxide     | .72 ppm                                      | 2 ppm   | 12" -24" below ceiling     | 50 ft                      |

## 2.02 ACCESSORIES

- A. Detector Guards E3PT- CAGE. The grid is made of a 9-gauge steel wire. The guard must be designed to allow calibration without removing the guards.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install hazardous gas monitoring equipment including sensors, audible alarms, as shown on Contract Drawings, and as recommended by manufacturer of equipment, and as required by authorities having jurisdiction.
- B. Install conduit and wiring from sensors to the fan starters/ HVAC control panel as recommended by manufacturer of equipment.

### 3.02 SEQUENCE OF OPERATION

- A. Normal Mode: The exhaust fans shall be controlled by the carbon monoxide gas detection system. At 25 ppm (CO) or .72 ppm (NO<sub>2</sub>), fans will operate until the carbon monoxide/nitrogen dioxide levels drop below 20 ppm or .7 ppm.  
An alarm will be given in the event carbon monoxide/nitrogen dioxide concentrations exceed 200 ppm/2 ppm.

### 3.03 COMMISSIONING

After installation, test and calibrate equipment to demonstrate operation of functions described above under sequence of operation by manufactures certified service technician.

Provide testing kits (including gas bottles) for testing and calibration by Commission technician.

### 3.04 WARRANTY

#### A. Limited Warranty

Honeywell Analytics, Inc. warrants to the original purchaser and/or ultimate customer ("Purchaser") of Vulcain products ("Product") that if any part thereof proves to be defective in material or workmanship within twelve (12) months, such defective part will be repaired or replaced, free of charge, at Honeywell Analytics' discretion if shipped prepaid to Honeywell Analytics at 4005 Matte Blvd., Unit G, Brossard, Quebec, Canada, J4Y 2P4, in a package equal to or in the original container. The Product will be returned freight prepaid and repaired or replaced if it is determined by Honeywell Analytics that the part failed due to defective materials or workmanship. The repair or replacement of any such defective part shall be Honeywell Analytics' sole and exclusive responsibility and liability under this limited warranty.

END OF SECTION 15282

**SECTION 15411 – WATER DISTRIBUTION PIPING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Requirements of the following Division 15 Sections apply to this section:
  - 1. "Basic Mechanical Requirements."
  - 2. "Basic Mechanical Materials and Methods."
  - 3. "Supports and Anchors."

**1.2 SUMMARY**

- A. This Section includes domestic cold water, hot water, and circulation hot water piping, fittings, and specialties within the building to a point 5 feet outside the building.

**1.3 DEFINITIONS**

- A. Water Distribution Pipe: A pipe within the building or on the premises that conveys water from the water service pipe or meter to the points of usage.
- B. Water Service Pipe: The pipe from the water main or other source of potable water supply to the water distributing system of the building served.
- C. Pipe sizes used in this Specification are nominal pipe size (NPS).

**1.4 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract.
  - 1. Product data for each piping specialty meter and valve specified.
  - 2. Test reports specified in Part 3 of this Section.
  - 3. Maintenance data for each piping specialty and valve specified for inclusion in Maintenance Manual.

**1.5 QUALITY ASSURANCE**

- A. Regulatory Requirements: Comply with the provisions of the following codes:
  - 1. ASME B31.9 "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store pipe in a manner to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate the installation of pipe sleeves for foundation wall penetrations.

1.8 EXTRA MATERIALS

- A. Maintenance Stock: Furnish one valve key for each key-operated wall hydrant, fixture supply, or faucet installed.

PART 2 - PRODUCTS

2.1 PIPE AND TUBE MATERIALS, GENERAL

- A. Pipe and Tube: Refer to Part 3, Article "Application, General," for identification of systems where the below materials are used.
- B. Copper Tube: ASTM B 88, Type L Water Tube, drawn temper.
- C. Copper Tube: ASTM B88, Type K water tube, annealed temper.

2.2 FITTINGS

- A. Wrought Copper Solder-Joint Fittings: ANSI B16.22, streamlined pattern.
- B. Wrought Copper and Bronze Grooved-End Fittings: ASTM B 75 Tube and ASTM B 584 Bronze Castings.
- C. Bronze Flanges: ANSI B16.24, Class 150, raised ground face, bolt holes spot faced.
- D. Unions: ASME B16.39, malleable iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces, female threaded ends. Threads shall conform to ASME B1.20.1.
- E. Dielectric Unions: Threaded, solder, or grooved-end connections as required to suit application; constructed to isolate dissimilar metals, prevent galvanic action, and prevent corrosion.

2.3 JOINING MATERIALS

- A. Solder Filler Metal: ASTM B 32, 95-5 Tin-Antimony.

- B. Brazing Filler Metals: AWS A5.8, BCuP Series.
- C. Gasket Material: Thickness, material, and type suitable for fluid to be handled and design temperatures and pressures.

#### 2.4 GENERAL-DUTY VALVES

- A. General-duty valves (i.e., gate, globe, check, and ball, valves) are specified in Division 15 Section "Valves." Special duty valves are specified below by their generic name; refer to Part 3 Article "Valve Application" for specific uses and applications for each valve specified.

#### 2.5 SPECIAL DUTY VALVES

- A. Balance Cocks: 400 psi WOG, 2 piece bronze, ball valve, handle, memory stop, with solder-end connections.

#### 2.6 PIPING SPECIALTIES

- A. Y-type Strainers: Cast-iron body, epoxy coated 125 psi flanges, removable cover with blow down tapping removable noncorrosive perforated strainer having 1/8 inch perforations.
- B. Water mixing valves shall be of the thermostatic type with liquid filled thermal motor. It shall have bronze body construction with replaceable corrosion resistant components. Valve construction shall employ a sliding piston control mechanism. Sliding piston and liners shall be of stainless steel material. Valve shall come equipped with union end stop and check inlets with removable stainless steel strainers. Valve shall provide protection against hot or cold supply line failure and the thermostat failure.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine rough-in requirements for plumbing fixtures and other equipment with water connections to verify actual locations of piping connections prior to installation.

#### 3.2 PIPE APPLICATIONS

- A. Install Type L, drawn copper tube with wrought copper fittings and solder joints for pipe sizes 4 inches and smaller, above ground, within building. Install Type K, annealed temper copper tube for pipe sizes 4 inches and smaller, with minimum number of brazed joints, below ground.

### 3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.
- B. Use fittings for all changes in direction and branch connections.
- C. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted unless expressly indicated.
- D. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- E. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- F. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1-inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
- G. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.
- H. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4-inch ball valve, and short 3/4-inch threaded nipple and cap.
- I. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls with sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inches shall be galvanized steel pipe; pipe sleeves 6 inches and larger shall be galvanized steel sheet metal.
- J. Fire Barrier Penetrations: Where pipes pass through fire-rated walls, partitions, ceilings, and floors, maintain the fire-rated integrity. Refer to Division 7 for special sealers and materials.
- K. Install piping level with no pitch.
- L. Expansion loops shall be provided in hot water piping. Expansion joints are to be avoided.

### 3.4 HANGERS AND SUPPORTS

- A. General: Hanger, support, and anchor devices conforming to MSS SP-69 are specified in Division 15 Section "Supports and Anchors." Conform to the table below for maximum spacing of supports:
- B. Pipe Attachments: Install the following:
1. Adjustable steel clevis hangers, MSS Type 1, for individual horizontal runs.
  2. Riser Clamp to support vertical runs.
- C. Install hangers for individual horizontal piping with the following maximum spacing and minimum rod sizes:

| <u>Nom. Pipe<br/>Size - In.</u> | <u>Copper Tube<br/>Max. Span - Ft.</u> | <u>Min. Rod<br/>Dia. - In.</u> |
|---------------------------------|--|--------------------------------|
| Up to 3/4                       | 6                                      | 3/8                            |
| 1                               | 6                                      | 3/8                            |
| 1-1/4                           | 6                                      | 3/8                            |
| 1-1/2                           | 10                                     | 3/8                            |
| 2                               | 10                                     | 3/8                            |
| 2-1/2                           | 10                                     | 1/2                            |
| 3                               | 10                                     | 1/2                            |
| 3-1/2                           | 10                                     | 1/2                            |
| 4                               | 10                                     | 1/2                            |

- D. Support vertical copper tube at each floor.

### 3.5 PIPE AND TUBE JOINT CONSTRUCTION

- A. Soldered Joints: Comply with the procedures contained in the AWS "Soldering Manual."
- B. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."
1. CAUTION: Remove stems, seats, and packing of valves and accessible internal parts of piping specialties before soldering and brazing.
  2. Fill the tubing and fittings during soldering and brazing with an inert gas (nitrogen or carbon dioxide) to prevent formation of scale.
  3. Heat joints to proper and uniform temperature.
- C. Flanged Joints: Align flange surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.



### 3.6 VALVE APPLICATIONS

- A. General-Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shut-off duty: Use gate, ball, and butterfly valves.
  - 2. Throttling duty: Use globe, ball, and butterfly valves.

### 3.7 INSTALLATION OF VALVES

- A. Sectional Valves: Install sectional valves on each branch and riser, close to main, where branch or riser serves 2 or more plumbing fixtures or equipment connections and elsewhere as indicated.
- B. Shutoff Valves: Install shutoff valves on inlet of each plumbing equipment item, on each supply to each plumbing fixture, all branch lines and risers and elsewhere as indicated. For shutoff valves 2 inches and smaller, use gate or ball valves; for shutoff valves 2-1/2 inches and larger, use gate valves.
- C. Drain Valves: Install drain valves on each plumbing equipment item, located to drain equipment completely for service or repair. Install drain valves at the base of each riser, at low points of horizontal runs, and elsewhere as required to drain distribution piping system completely. For drain valves 2 inches and smaller, use gate or ball valves.
- D. Check Valves: Install swing check valves on discharge side of each pump and elsewhere as indicated.
- E. Balance Cocks: Install in each hot water recirculating loop, discharge side of each pump, and elsewhere as indicated.

### 3.8 INSTALLATION OF PIPING SPECIALTIES

- A. Install backflow preventers at each connection to mechanical equipment and systems and in compliance with the plumbing code and authority having jurisdiction. Locate in same room as equipment being connected. Install air gap fitting and pipe relief outlet drain without valves to nearest floor drain.
- B. Install water hammer arrestors for each flush valve. Size in accordance with manufacturer's instructions.

### 3.9 EQUIPMENT CONNECTIONS

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by plumbing code.

- B. Mechanical Equipment Connections: Connect hot and cold water piping system to mechanical equipment as indicated. Provide shutoff valve and union for each connection; provide drain valve on drain connection.

### 3.10 FIELD QUALITY CONTROL

- A. Inspections: Inspect water distribution piping as follows:
1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.
  2. During the progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.
    - a. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed in after system is roughed in and prior to setting fixtures.
    - b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to ensure compliance with the requirements of the plumbing code.
  3. Reinspections: Whenever the plumbing official finds that the piping system will not pass the test or inspection, make the required corrections and arrange for reinspection by the plumbing official.
  4. Reports: Prepare inspection reports signed by the plumbing official.
- B. Test water distribution piping as follows:
1. Test for leaks and defects all new water distribution piping systems and parts of existing systems that have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
  2. Leave uncovered and unconcealed all new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose all such work for testing that has been covered or concealed before it has been tested and approved.
  3. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding the pressure rating of the piping system materials. Isolate the test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
  4. Repair all leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
  5. Prepare reports for all tests and required corrective action.

### 3.11 ADJUSTING AND CLEANING

- A. Clean and disinfect water distribution piping as follows:

1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired prior to use.
  2. Use the purging and disinfecting procedure proscribed by the authority having jurisdiction or, in case a method is not proscribed by that authority, the procedure described in the 2003 International Plumbing Code.
    - a. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.
- B. Prepare reports for all purging and disinfecting activities.

### 3.12 COMMISSIONING

- A. Fill the system. Check that the system is completely full of water.
- B. Before operating the system, perform these steps:
1. Close drain valve, hydrants, and hose bibs.
  2. Open valves to full open position.
  3. Remove and clean strainers.
  4. Check pumps for proper direction of rotation. Correct improper wiring.
  5. Lubricate pump motors and bearings.

END OF SECTION 15411

**SECTION 15420 – DRAINAGE AND VENT SYSTEMS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes building sanitary and vent piping systems, including drains and drainage specialties.
  - 1. PVC Sewer Pipe ASTM D2729 may be used. See Part 2.
  - 2. All drainage and vent piping shall be ASTM 2836-72 solvent welded PVC or ASTM D2751 solvent welded ABS.
  - 3. No cellular foam core PVC shall be allowed. See Part 2.

**1.2 DEFINITIONS**

- A. Building Drain: That part of the lowest piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer.
- B. Building Sewer: That part of the drainage system which extends from the end of the building drain and conveys its discharge to a public sewer, private sewer, individual sewage disposal system, or other point of disposal.
- C. Drainage System: Includes all the piping within a public or private premises which conveys sewage, rain water or other liquid wastes to a point of disposal. It does not include the mains of public sewer systems or a private or public sewage treatment or disposal plant.
- D. Vent System: A pipe or pipes installed to provide a flow of air to or from a drainage system, or to provide a circulation of air within such system to protect trap seals from siphonage and back pressure.

**1.3 SUBMITTALS**

- A. Product data for the following products:
  - 1. Drainage piping specialties

**1.4 QUALITY ASSURANCE**

- A. Regulatory Requirements: comply with the provisions of the following:
  - 1. International Plumbing Code.

**1.5 SEQUENCING AND SCHEDULING**

- A. Coordinate the installation of roof penetrations.
- B. Coordinate flashing materials installation of roofing, waterproofing, and adjoining substrate work.
- C. Coordinate the installation of drains in poured-in-place concrete slabs, to include proper drain elevations, installation of flashing, and slope of slab to drains.
- D. Coordinate with installation of sanitary and storm sewer systems as necessary to interface building drains with drainage piping systems.

**PART 2 - PRODUCTS**

**2.1 ABOVE GROUND DRAINAGE AND VENT PIPE AND FITTINGS**

- A. Copper Tube: ASTM B306, Type DWV for pipe, and cast-bronze, drainage pattern fittings, with soldered joints.
  - 1. Solder Filler Materials: ASTM B32, 50-50 tin-lead solder.
- B. Cast-Iron Soil Pipe: ASTM A74, Service weight, hub-and-spigot soil pipe and fittings.
  - 1. Clamps and compression gaskets: ASTM C564.
- C. Hubless Cast-Iron Soil Pipe: CISPI Standard 301, Service weight, cast-iron soil pipe and fittings, with neoprene gaskets conforming to CISPI Standard 310.

**2.2 UNDERGROUND BUILDING DRAIN PIPE AND FITTINGS**

- A. Cast-Iron Soil Pipe: ASTM A74, Extra-Heavy weight, hub-and-spigot soil pipe and fittings. Pipe and fittings shall have a heavy coating of coal tar varnish or asphaltum on both inside and outside surfaces.
  - 1. Neoprene Compression Gaskets: ASTM C564.
- B. PVC Sewer Pipe ASTM D2729.

**2.3 DRAINAGE PIPING SPECIALTIES**

- A. Backwater Valves: Valve assembly shall be bronze fitted cast-iron, with bolted cover. Flapper shall provide a maximum 1/4 inch clearance between flapper and seat for air circulation. Valve ends shall suit piping material.
- B. Trap Primers: Bronze body valve with automatic vacuum breaker, with 1/2 inch connections matching piping system. Complying with ASSE 1018.
- C. Expansion Joints: Cast-iron body with adjustable bronze sleeve, bronze bolts with wing nuts.
- D. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1, countersunk head.
- E. Floor Cleanouts: Cast-iron body and frame, with cleanout plug and adjustable round top as follows:
  - 1. Nickel-Bronze Top: Manufacturer's standard cast unit with the following patterns:
    - a. Exposed rim type, with recess to receive 1/8 inch thick resilient floor finish.
    - b. Exposed rim type, with recess to receive 1 inch thick terrazzo floor finish.
    - c. Exposed finish type, standard mill finish.
    - d. Exposed flush type, standard non-slip scored or abrasive finish.
  - 2. Cast-iron Top: Manufacturer's standard cast unit with the following patterns:
    - a. Exposed flush type, standard mill finish.
    - b. Exposed flush type, standard non-slip scored or abrasive finish.
- F. Wall Cleanouts: Cast-iron body adaptable to pipe with cast-bronze or brass cleanout plug; stainless steel cover including screws.
- G. Flashing Flanges: Cast-iron watertight stack or wall sleeve with membrane flashing ring. Provide underdeck clamp and sleeve length as required.
- H. Vent Flashing Sleeves: Cast-iron calking type roof coupling for cast-iron stacks, cast-iron threaded type roof coupling for steel stacks, and cast-bronze stack flashing sleeve for copper tubing.
- I. Frost-Proof Vent Caps: Construct of galvanized iron, sized to provide 1 inch air space between outside of vent pipe and inside of flashing collar extension.
- J. Vandal-Proof Vent Caps: Cast-iron body full size of vent pipe, with calked base connection for cast-iron pipes, threaded base for steel pipes.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verify existing grades, inverts, utilities, obstacles, and topographical conditions prior to installations.
- B. Examine rough-in requirements for plumbing fixtures and other equipment having drain connections to verify actual locations of piping connections prior to installation.
- C. Examine walls, floors, roof, and plumbing chases for suitable conditions where piping and specialties are to be installed.
- D. Do not proceed until unsatisfactory conditions have been corrected.

**3.2 PREPARATION FOUNDATION FOR UNDERGROUND BUILDING DRAINS**

- A. Grade trench bottoms to provide a smooth, firm, and stable foundation, free from rock, throughout the length of the pipe.
- B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to required invert elevation.
- C. Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand backfill. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation.

**3.3 PIPE APPLICATIONS - ABOVE GROUND, WITHIN BUILDING**

- A. Install copper tube with cast bronze fittings for 3 inch and smaller, drainage and vent pipe.
- B. Install hub-and-spigot, service weight, cast-iron soil pipe with lead and oakum calked joints for larger than 3 inch drainage and vent pipe.
- C. Install hub-and-spigot, service weight, cast-iron soil pipe with compression gasket joints for larger than 3 inch drainage and vent pipe.
- D. Install hubless, service weight, cast-iron soil pipe and fittings for larger than 3 inch drainage and vent pipe.

**3.4 PIPE APPLICATIONS - BELOW GROUND, WITHIN BUILDING**

- A. Install hub-and-spigot, extra-heavy weight cast-iron, soil pipe and fittings with lead-and-oakum calked joints for 15 inch and smaller drainage pipe.
- B. Install hub-and-spigot, extra-heavy weight, cast-iron, soil pipe and fittings with gasketed joints for 15 inch and smaller drainage pipe.

### 3.5 PIPE AND TUBE JOINT CONSTRUCTION

- A. Copper Tubing: Solder joints in accordance with the procedures specified in AWS "Soldering Manual."
- B. Cast-Iron Soil Pipe: Make lead and oakum calked joints, compression joints, and hubless joints in accordance with the recommendations in the CISPI Cast Iron Soil Pipe and Fittings Handbook, Chapter IV.

### 3.6 INSTALLATION

- A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into account many design considerations. So far as practical, install piping as required.
- B. Use fittings for all changes in direction and all branch connections.
- C. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted.
- D. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- E. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors.
- F. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Allow sufficient space above removable ceiling panels to allow for panel removal.
- G. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inch shall be steel; pipe sleeves 6 inch and larger shall be sheet metal.
- H. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings and floors, maintain the fire rated integrity.



- I. Make changes in direction for drainage and vent piping using appropriate 45 degree wyes, half-wyes, or long sweep quarter, sixth, eighth, or sixteenth bends. Sanitary tees or short quarter bends may be used on vertical stacks of drainage lines where the change in direction of flow is from horizontal to vertical, except use long-turn tees where two fixtures are installed back to back and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. No change in direction of flow greater than 90 degrees shall be made. Where different sizes of drainage pipes and fittings are connected, use proper size, standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.
- J. Install underground building drains to conform with the plumbing code, and in accordance with the Cast Iron Soil Pipe Institute Engineering Manual. Lay underground building drains beginning at low point of systems, true to grades and alignment required with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- K. Install building drain pitched down at minimum slope of 1/4 inch per foot (2 percent) for piping 3 inch and smaller, and 1/8 inch per foot (1 percent) for piping 4 inch and larger.
- L. Extend building drain to connect to sewer piping, of size and in location required for service entrance to building.
- M. Install sleeve and mechanical sleeve seal through foundation wall for watertight installation.
- N. Install 1 inch thick extruded polystyrene over underground building drain piping not under building. Width of insulation shall extend minimum of 12" beyond each side of pipe. Install directly over, and center on pipe center line.
- O. Insulate all waste stacks for their entire length, and continue over fittings etc.

### 3.7 HANGERS AND SUPPORTS

- A. General: Hanger, supports, and anchors devices are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Install hangers for horizontal piping with the following maximum spacing and minimum rod sizes as required by current International Plumbing Codes and requirements of Governing Authorities:

### 3.8 INSTALLATION OF PIPING SPECIALTIES

- A. Install backwater valves in sanitary building drain piping as required, and as required by the plumbing code. For interior installation, provide cleanout cover flush to floor centered over backwater valve cover and of adequate size to remove valve cover for service.
- B. Install expansion joints on vertical risers as required, and as required by the plumbing code.
- C. Above Ground Cleanouts: Install in above ground piping and building drain piping as required, and:
  - 1. as required by plumbing code;
  - 2. at each change in direction of piping greater than 45 degrees;
  - 3. at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping;
  - 4. at base of each vertical soil or waste stack.
- D. Cleanouts Covers: Install floor and wall cleanout covers for concealed piping, types as required.
- E. Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.
- F. Vent Flashing Sleeves: Install on stacks passing through roof, secure over stack flashing in accordance with manufacturer's instructions.
- G. Frost-Proof Vent Caps: Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1 inch clearance between vent pipe and roof substrate.

### 3.9 CONNECTIONS

- A. Piping Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes; but in no case smaller than required by the plumbing code.
- B. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

### 3.10 FIELD QUALITY CONTROL

- A. Inspections
  - 1. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.

2. During the progress of the installation, notify the plumbing official having jurisdiction, at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.
    - a. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.
    - b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the plumbing code.
  3. Reinspections: Whenever the piping system fails to pass the test or inspection, make the required corrections, and arrange for reinspected by the plumbing official.
  4. Reports: Prepare inspection reports, signed by the plumbing official.
- B. Piping System Test: Test drainage and vent system in accordance with the procedures of the authority having jurisdiction, or in the absence of a published procedure, as follows:
1. Test for leaks and defects all new drainage and vent piping systems and parts of existing systems, which have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
  2. Leave uncovered and unconcealed all new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose all such work for testing, that has been covered or concealed before it has been tested and approved.
  3. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open jointed drain tile, test the piping of plumbing drainage and venting systems upon completion of the rough piping installation. Tightly close all openings in the piping system, and fill with water to the point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before the inspection starts, through completion of the inspection. Inspect all joints for leaks.
  4. Finished Plumbing Test Procedure: After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas and water-tight. Plug the stack openings on the roof and building drain where it leaves the building, and introduce air into the system equal to a pressure of 1" water column. Use a "U" tube or manometer inserted in the trap of a water closet to measure this pressure. Air pressure shall remain constant without the introduction of additional air throughout the period of inspection. Inspect all plumbing fixture connections for gas and water leaks.
  5. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.

6. Prepare reports for all tests and required corrective action.

### 3.11 ADJUSTING AND CLEANING

- A. Clean interior of piping system. Remove dirt and debris as work progresses.
- B. Clean drain strainers, domes, and traps. Remove dirt and debris.

### 3.12 PROTECTION

- A. Protect drains during remainder of construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

END OF SECTION 15420

**SECTION 15498 – FACILITY LIQUEFIED-PETROLEUM GAS PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Mechanical sleeve seals.

**1.2 PERFORMANCE REQUIREMENTS**

**A. Minimum Operating-Pressure Ratings:**

1. For Piping Containing Only Vapor:
  - a. Piping and Valves: 125 psig unless otherwise indicated.
2. For Piping Containing Liquid:
  - a. Piping between Shutoff Valves: 350 psig unless otherwise indicated.
  - b. Piping Other Than Above: 250 psig unless otherwise indicated.
  - c. Valves and Fittings: 250 psig unless otherwise indicated.

- B. Delegated Design:** Design restraints and anchors for LPG piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

**1.3 SUBMITTALS**

- A. Product Data:** For each type of product indicated.

- B. Shop Drawings:** For facility LPG piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT      FACILITY LIQUEFIED-PETROLEUM GAS PIPING      15489-2**

same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

- C. Delegated-Design Submittal: For LPG piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Detail fabrication and assembly of seismic restraints.
  - 2. Design Calculations: Calculate requirements for selecting seismic restraints.
- D. Seismic Qualification Certificates: Submit certification that vaporizer, storage container supports, accessories, and components will withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment." Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Welding certificates.
- F. Field quality-control reports.
- G. Operation and maintenance data.

**1.4      QUALITY ASSURANCE**

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. 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.

## **PART 2 - PRODUCTS**

### **2.1      PIPES, TUBES, AND FITTINGS**

- A.    Steel Pipe:    ASTM A 53/A 53M, black steel, Schedules 40 and 80, Type E or S, Grade B.
  - 1.    Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
  - 2.    Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
  - 3.    Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
  - 4.    Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
    - a.    Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
- B.    Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.
  - 1.    Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a.    OmegaFlex, Inc.
    - b.    Parker Hannifin Corporation; Parflex Division.
    - c.    Titeflex.
    - d.    Tru-Flex Metal Hose Corp.
  - 2.    Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
  - 3.    Coating: PE with flame retardant.
    - a.    Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      - 1)    Flame-Spread Index: 25.
      - 2)    Smoke-Developed Index: 50.
  - 4.    Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
  - 5.    Striker Plates: Steel, designed to protect tubing from penetrations.

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT      FACILITY LIQUEFIED-PETROLEUM GAS PIPING      15489-4**

6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
- C. Annealed-Temper Copper Tube: Comply with ASTM B 88, Type L
1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
  2. Flare Fittings: Comply with ASME B16.26 and SAE J513.
    - a. Copper fittings with long nuts.
    - b. Metal-to-metal compression seal without gasket.
    - c. Dryseal threads complying with ASME B1.20.3.
  3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch (0.56 mm) thick.
- D. PE Pipe: ASTM D 2513, SDR 11.
1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
  2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
  3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
    - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
    - b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B with corrosion-protective coating covering. Vent casing aboveground.
    - c. Aboveground Portion: PE transition fitting.
    - d. Outlet shall be threaded suitable for welded connection.
    - e. Tracer wire connection.
    - f. Ultraviolet shield.
    - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
  4. Transition Service-Line Risers: Factory fabricated and leak tested.
    - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
    - b. Outlet shall be threaded suitable for welded connection.
    - c. Bridging sleeve over mechanical coupling.



- d. Factory-connected anode.
- e. Tracer wire connection.
- f. Ultraviolet shield.
- g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

## **2.2 PIPING SPECIALTIES**

### **A. Flexible Piping Joints:**

- 1. Approved for LPG service.
- 2. Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
- 3. Minimum working pressure of 250 psig (1723 kPa) and 250 deg F (121 deg C) operating temperature.
- 4. Threaded-end connections to match equipment connected and shall be capable of minimum 3/4-inch (20-mm) misalignment.
- 5. Maximum 36-inch (914-mm) length for liquid LPG lines.

### **B. Appliance Flexible Connectors:**

- 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
- 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
- 3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
- 4. Corrugated stainless-steel tubing with polymer coating.
- 5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
- 6. End Fittings: Zinc-coated steel.
- 7. Threaded Ends: Comply with ASME B1.20.1.
- 8. Maximum Length: 72 inches (1830 mm).

### **C. Quick-Disconnect Devices: Comply with ANSI Z21.41.**

- 1. Copper-alloy convenience outlet and matching plug connector.
- 2. Nitrile seals.
- 3. Hand operated with automatic shutoff when disconnected.
- 4. For indoor or outdoor applications.
- 5. Adjustable, retractable restraining cable.

### **D. Y-Pattern Strainers:**

- 1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
- 2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller.

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT      FACILITY LIQUEFIED-PETROLEUM GAS PIPING      15489-6**

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- 3. Strainer Screen: 40-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
- 4. CWP Rating: 125 psig (862 kPa).
- E. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

**2.3 JOINING MATERIALS**

- A. Joint Compound and Tape: Suitable for LPG.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M.

**2.4 MANUAL GAS SHUTOFF VALVES**

- A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.
- B. Metallic Valves, NPS 2 (DN 50) and Smaller for Liquid Service: Comply with ASME B16.33 and UL 842.
  - 1. CWP Rating: 250 psig (1723 kPa)
  - 2. Threaded Ends: Comply with ASME B1.20.1.
  - 3. Socket ends for brazed joints.
  - 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  - 5. Listing by CSA or agency acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
  - 6. Valves 1-1/4 inch (32 mm) and larger shall be suitable for LPG service, with "WOG" indicated on valve body.
- C. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller for Vapor Service: Comply with ASME B16.33.
  - 1. CWP Rating: 125 psig (862 kPa).

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT      FACILITY LIQUEFIED-PETROLEUM GAS PIPING      15489-7**

2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
6. Service Mark: Valves 1-1/4 inch (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.

**D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. BrassCraft Manufacturing Company; a Masco company.
  - b. Conbraco Industries, Inc.; Apollo Div.
  - c. Lyall, R. W. & Company, Inc.
  - d. McDonald, A. Y. Mfg. Co.
  - e. Perfection Corporation; a subsidiary of American Meter Company.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4143 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for LPG service with "WOG" indicated on valve body.

**E. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. BrassCraft Manufacturing Company; a Masco company.
  - b. Conbraco Industries, Inc.; Apollo Div.
  - c. Lyall, R. W. & Company, Inc.
  - d. McDonald, A. Y. Mfg. Co.
  - e. Perfection Corporation; a subsidiary of American Meter Company.

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT      FACILITY LIQUEFIED-PETROLEUM GAS PIPING      15489-8**

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4143 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for LPG service with "WOG" indicated on valve body.

**F. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. BrassCraft Manufacturing Company; a Masco company.
  - b. Conbraco Industries, Inc.; Apollo Div.
  - c. Lyall, R. W. & Company, Inc.
  - d. McDonald, A. Y. Mfg. Co.
  - e. Perfection Corporation; a subsidiary of American Meter Company.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for LPG service with "WOG" indicated on valve body.

**G. Bronze Plug Valves: MSS SP-78.**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Lee Brass Company.

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT FACILITY LIQUEFIED-PETROLEUM GAS PIPING**

**15489-9**

- b. McDonald, A. Y. Mfg. Co.
  - 2. Body: Bronze, complying with ASTM B 584.
  - 3. Plug: Bronze.
  - 4. Ends: Threaded or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  - 5. Operator: Square head or lug type with tamperproof feature where indicated.
  - 6. Pressure Class: 125 psig (862 kPa).
  - 7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
  - 8. Service: Suitable for LPG service with "WOG" indicated on valve body.
- H. PE Ball Valves: Comply with ASME B16.40.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Kerotest Manufacturing Corp.
    - b. Lyall, R. W. & Company, Inc.
    - c. Perfection Corporation; a subsidiary of American Meter Company.
  - 2. Body: PE.
  - 3. Ball: PE.
  - 4. Stem: Acetal.
  - 5. Seats and Seals: Nitrile.
  - 6. Ends: Plain or fusible to match piping.
  - 7. CWP Rating: 80 psig (552 kPa).
  - 8. Operating Temperature: Minus 20 to plus 140 deg F .
  - 9. Operator: Nut or flat head for key operation.
  - 10. Include plastic valve extension.
  - 11. Include tamperproof locking feature for valves where indicated on Drawings.
- I. Valve Boxes:
  - 1. Cast-iron, two-section box.
  - 2. Top section with cover with "GAS" lettering.
  - 3. Bottom section with base to fit over valve and barrel a minimum of 5 inches (125 mm) in diameter.
  - 4. Adjustable cast-iron extensions of length required for depth of bury.
  - 5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head and with stem of length required to operate valve.

**2.5      MOTORIZED GAS VALVES**

- A.    Hydrostatic Relief Valves: Comply with NFPA 58.
  - 1.    Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a.    Engineered Controls International, Inc.; RegO Products.
    - b.    Fisher Control Valves and Regulators; Division of Emerson Process Management.
    - c.    Murray Equipment, Inc.
    - d.    Sherwood; a division of Harsco Corporation.
  - 2.    Operating Pressure: 350 psig (2413 kPa).
  - 3.    Body: Brass.
  - 4.    Spring: Stainless steel.
  - 5.    Disc and Seat: Nitrile.
  - 6.    Brass body and stainless-steel, spring-operated valve with resilient rubber disc seat and protective cap.
  - 7.    Factory set and tested.
  - 8.    Listing: Valves listed and labeled by an NRTL acceptable to authorities having jurisdiction.
  - 9.    Valve shall reseal after relieving pressure.
- B.    Electrically Operated Valves: Comply with UL 429.
  - 1.    Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a.    ASCO.
    - b.    ASCO Power Technologies, LP; Division of Emerson.
    - c.    Dungs, Karl, Inc.
    - d.    Eclipse Combustion, Inc.
    - e.    Goyen Valve Corp.; Tyco Environmental Systems.
    - f.    Magnatrol Valve Corporation.
    - g.    Parker Hannifin Corporation; Climate & Industrial Controls Group; Skinner Valve Div.
    - h.    Watts Regulator Co.; Division of Watts Water Technologies, Inc.
  - 2.    Pilot operated.
  - 3.    Body: Brass or aluminum.
  - 4.    Seats and Disc: Nitrile rubber.
  - 5.    Springs and Valve Trim: Stainless steel.
  - 6.    120-V ac, 60 Hz, Class B, continuous-duty molded coil, replaceable.

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT      FACILITY LIQUEFIED-PETROLEUM GAS PIPING      15489-11**

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7. NEMA ICS 6, Type 4, coil enclosure.
8. Normally closed.
9. Visual position indicator.

## 2.6 EARTHQUAKE VALVES

### A. Earthquake Valves: Comply with ASCE 25.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Vanguard Valves, Inc.
  - b. Engineer approved equal.
2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
3. Maximum Operating Pressure: 5 psig (34.5 kPa).
4. Cast-aluminum body with nickel-plated chrome steel internal parts.
5. Nitrile-rubber valve washer.
6. Sight windows for visual indication of valve position.
7. Threaded-end connections complying with ASME B1.20.1.

### B. Earthquake Valves: Comply with ASCE 25.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Pacific Seismic Products, Inc.
  - b. Engineer approved equal.
2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
3. Cast-aluminum body with stainless-steel internal parts.
4. Nitrile-rubber, reset-stem o-ring seal.
5. Valve position, open or closed, indicator.
6. Composition valve seat with clapper held by spring or magnet locking mechanism.
7. Level indicator.
8. End Connections: Threaded for valves NPS 2 (DN 50) and smaller.

## 2.7 PRESSURE REGULATORS

### A. General Requirements:

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT      FACILITY LIQUEFIED-PETROLEUM GAS PIPING**

**15489-12**

1. Single stage and suitable for LPG.
  2. Steel jacket and corrosion-resistant components.
  3. Elevation compensator.
  4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller.
- B. Line Pressure Regulators: Comply with ANSI Z21.80.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Actaris.
    - b. American Meter Company.
    - c. Eclipse Combustion, Inc.
    - d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
    - e. Invensys.
    - f. Maxitrol Company.
    - g. Richards Industries; Jordan Valve Div.
  2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
  3. Springs: Zinc-plated steel; interchangeable.
  4. Diaphragm Plate: Zinc-plated steel.
  5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
  6. Orifice: Aluminum; interchangeable.
  7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
  8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet and no pressure sensing piping external to the regulator.
  9. Pressure regulator shall maintain discharge pressure setting downstream and not exceed 150 percent of design discharge pressure at shutoff.
  10. Overpressure Protection Device: Factory mounted on pressure regulator.
  11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
- C. Appliance Pressure Regulators: Comply with ANSI Z21.18.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Canadian Meter Company Inc.
    - b. Eaton Corporation; Controls Div.
    - c. Harper Wyman Co.
    - d. Maxitrol Company.
    - e. SCP, Inc.



2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

## **2.8      DIELECTRIC UNIONS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Capitol Manufacturing Company.
  2. Central Plastics Company.
  3. Hart Industries International, Inc.
  4. McDonald, A. Y. Mfg. Co.
  5. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
  6. Wilkins; Zurn Plumbing Products Group.
- B. Minimum Operating-Pressure Rating: 150 psig (1034 kPa).
- C. Combination fitting of copper alloy and ferrous materials.
- D. Insulating materials suitable for LPG.
- E. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

## **2.9      SLEEVES**

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

**2.10      MECHANICAL SLEEVE SEALS**

- A.    Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
1.    Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a.    Advance Products & Systems, Inc.
    - b.    Calpico Inc.
    - c.    Metraflex Company (The).
    - d.    Pipeline Seal and Insulator, Inc.
  2.    Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
  3.    Pressure Plates: Carbon steel.
  4.    Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

**2.11      LABELING AND IDENTIFYING**

- A.    Detectable Warning Tape: Acid- and alkali-resistant PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

**PART 3 - EXECUTION**

**3.1      EARTHWORK**

- A.    Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

**3.2      INDOOR PIPING INSTALLATION**

- A.    Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of LPG piping.
- B.    Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C.    Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D.    Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E.    Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F.    Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G.    Locate valves for easy access.
- H.    Install LPG piping at uniform grade of 2 percent down toward drip and sediment traps.
- I.    Install piping free of sags and bends.
- J.    Install fittings for changes in direction and branch connections.
- K.    Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping" for materials.
- L.    Verify final equipment locations for roughing-in.
- M.    Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- N.    Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- O. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- P. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- R. Connect branch piping from top or side of horizontal piping.
- S. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment.
- T. Do not use LPG piping as grounding electrode.
- U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- V. Install pressure gage downstream from each line regulator. Pressure gages are specified in Division 23 Section "Meters and Gages for HVAC Piping."

### **3.3 VALVE INSTALLATION**

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install earthquake valves aboveground outside buildings according to listing.
- E. Install anode for metallic valves in underground PE piping.

**3.4      PIPING JOINT CONSTRUCTION**

- A.    Ream ends of pipes and tubes and remove burrs.
- B.    Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C.    Threaded Joints:
  - 1.    Thread pipe with tapered pipe threads complying with ASME B1.20.1.
  - 2.    Cut threads full and clean using sharp dies.
  - 3.    Ream threaded pipe ends to remove burrs and restore full ID of pipe.
  - 4.    Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
  - 5.    Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D.    Welded Joints:
  - 1.    Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
  - 2.    Bevel plain ends of steel pipe.
  - 3.    Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E.    Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Ch. 22, "Pipe and Tube."
- F.    Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.
- G.    PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
  - 1.    Plain-End Pipe and Fittings: Use butt fusion.
  - 2.    Plain-End Pipe and Socket Fittings: Use socket fusion.

### **3.5      HANGER AND SUPPORT INSTALLATION**

- A.    Install seismic restraints on piping.    Comply with requirements for seismic-restraint devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- B.    Comply with requirements for pipe hangers and supports specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- C.    Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
  - 1.    NPS 1 (DN 25) and Smaller:    Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).
  - 2.    NPS 1-1/4 (DN 32):    Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
  - 3.    NPS 1-1/2 and NPS 2 (DN 40 and DN 50):    Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
- D.    Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:
  - 1.    NPS 3/8 (DN 10):    Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
  - 2.    NPS 1/2 (DN 15):    Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
  - 3.    NPS 3/4 (DN 20) and Larger:    Maximum span, 96 inches (2440 mm); minimum rod, 3/8 inch (10 mm).

### **3.6      CONNECTIONS**

- A.    Connect to utility's gas main according to utility's procedures and requirements.
- B.    Install LPG piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C.    Install piping adjacent to appliances to allow service and maintenance of appliances.
- D.    Connect piping to appliances using manual gas shutoff valves and unions.    Install valve within 72 inches (1830 mm) of each gas-fired appliances and equipment.    Install union between valve and appliances or equipment.

- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

### **3.7 LABELING AND IDENTIFYING**

- A. Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, 12 inches (305 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

### **3.8 FIELD QUALITY CONTROL**

- A. Test, inspect, and purge LPG according to NFPA 58 and NFPA 54 and the International Fuel Gas Code and requirements of authorities having jurisdiction.
- B. LPG piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### **3.9 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG (3.45 kPa)**

- A. Aboveground, branch piping NPS 1 (DN 25) and smaller shall be one of the following:
  - 1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
  - 2. Annealed-temper copper tube with wrought-copper fittings and brazed joints.
  - 3. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be one of the following:
  - 1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
  - 2. Schedule 40, steel pipe with wrought-steel fittings and welded joints.
- C. Underground, below building, piping shall be one of the following:
  - 1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
  - 2. Schedule 40, steel pipe with wrought-steel fittings and welded joints.

- D. Containment Conduit: Schedule 40, steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- E. Containment Conduit Vent Piping: Schedule 40, steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

**3.10      INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG (3.45 kPa) AND LESS THAN 5 PSIG (34.5 kPa)**

- A. Aboveground, branch piping NPS 1 (DN 25) and smaller shall be one of the following:
  - 1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
  - 2. Annealed-temper copper tube, Type L (Type B) with wrought-copper fittings and brazed joints.
  - 3. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be one of the following:
  - 1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
  - 2. Schedule 40, steel pipe with steel welding fittings and welded joints.
- C. Underground, below building, piping shall be one of the following:
  - 1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
  - 2. Schedule 40, steel pipe with wrought-steel fittings and welded joints.
- D. Containment Conduit: Schedule 40, steel pipe with wrought-steel fittings and welded joints. Coat underground pipe and fittings with protective coating for steel piping.
- E. Containment Conduit Vent Piping: Schedule 40, steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

**3.11      ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE**

- A. Aboveground Liquid Piping:
  - 1. Two-piece, full-port, bronze ball valves with bronze trim.



**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT      FACILITY LIQUEFIED-PETROLEUM GAS PIPING      15489-21**

- B. Valves for pipe NPS 2 (DN 50) and smaller at service meter shall be one of the following:
  - 1. One-piece, bronze ball valve with bronze trim.
  - 2. Two-piece, full-port, bronze ball valves with bronze trim.
  - 3. Bronze plug valve.
  
- C. Distribution piping valves for pipe NPS 2 (DN 50) and smaller shall be one of the following:
  - 1. One-piece, bronze ball valve with bronze trim.
  - 2. Two-piece, full-port, bronze ball valves with bronze trim.
  - 3. Bronze plug valve.
  
- D. Valves in branch piping for single appliance shall be one of the following:
  - 1. One-piece, bronze ball valve with bronze trim.
  - 2. Two-piece, full-port, bronze ball valves with bronze trim.
  - 3. Bronze plug valve.

END OF SECTION 15489

**SECTION 15700 – HVAC SPLIT SYSTEMS**

**PART 1 - GENERAL**

**1.1 SYSTEM DESCRIPTION**

- A. Exterior air cooled condensing units with an indoor ductless fan coil units.

**1.2 QUALITY ASSURANCE**

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.)
- C. The units shall be rated in accordance with Air-conditioning Refrigeration Institute's (ARI) Standard 210 / 240 and bear the ARI Certification label.
- D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to product manufacturing quality and environmental management and protection set by the International Standard Organization (ISO).
- E. A dry air holding charge shall be provided in the indoor section.
- F. The outdoor unit shall be pre-charged with (R-410a) refrigerant.
- G. System efficiency shall meet or exceed 14.0 SEER.

**1.3 DELIVERY, STORAGE AND HANDLING**

- A. Unit shall be stored inside and carefully handled according to the manufacturer's recommendations.

**PART 2 - WARRANTY**

**2.1 WARRANTY**

- A. The units shall have a manufacturer's parts and defects warranty for a period one (1) year from owners acceptance. The compressor shall have a warranty of 6 years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.

- B. Manufacturer shall have over 25 years of continuous experience in the U.S. market.

## **PART 3 – PRODUCTS**

### **3.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include but are limited to, the following:
1. Trane.
  2. Carrier.
  3. York.

### **3.2 INDOOR UNIT**

- A. General:
1. Furnish and install direct expansion LP fired furnace equipped with cooling control kit in the location and manner shown on the plans. Unit shall operate properly in vertical upflow position and is to be installed with ductwork.
  2. Contained within the indoor unit shall be all factory wiring, piping, control circuit board, fan and fan motor.
  3. The unit shall have a self-diagnostic function, 3-minute restart time delay mechanism, an auto restart function, an emergency / test operation.
  4. Indoor units shall be charged with dry air before shipment from factory.
- B. Unit Cabinet:
1. Unit enclosure shall be insulated with a 1 inch foil faced, high density, R4.2 insulation, and be constructed of prepainted galvanized steel. Large front service access panels shall provide easy access to all components. Unit shall be equipped with reusable type filters.
- C. Fan:
1. Fan shall be forward curved with double inlet, mounted on motor shaft, dynamically and statically balanced. Fan-motor assembly shall be removable for service. Blower motor shall be induction type.
- D. Filter:
1. Return air shall be filtered by means of an easily removed, washable, Catechin, Antioxidant Pre-filter and a separate Anti-allergy enzyme filter – blue bellows type.

- E. Coil:
  - 1. Cooling coil shall be constructed with brazed copper tubing with aluminum lanced fins. Coil shall have TXV ( thermal expansion valve); refrigerant line fittings which permit braze connections. Condensate pans shall be equipped with primary and auxiliary drain connections with brass inserts, sloping, with minimal standing water retention. Refrigerant to be used will be R-410a.
- F. Control:
  - 1. Blower controls include control board with time delay relay, a 5 amp replaceable automotive-type circuit protection fuse, and motor speed tap selection terminal (SPT).
  - 2. Cooling control system includes 40-VA control circuit (24 v) transformer, with replaceable 5 amp blade-type auto fuse. Low voltage connections shall be point-to-point "wire" connections.

#### **PART 4 – OUTDOOR UNIT**

##### **4.1 OUTDOOR UNIT**

- A. Factory assembled, single piece, air-cooled air conditioner unit. Contained within the unit enclosure is all factory wiring, piping, controls, compressor, refrigerant charge R-410A, and special features required prior to field start-up.
- B. Unit cabinet, including louvered coil guard, will be constructed of galvanized steel, bonderized, and coated with a powder coat paint.
- C. Condenser fan will be direct-drive forward-swept propeller type, discharging air upward.
- D. Condenser fan motors will be totally enclosed, 1-phase type with class B insulation and permanently lubricated bearings. Shafts will be corrosion resistant.
  - 1. Fan blades will be statically and dynamically balanced.
  - 2. Condenser fan openings will be equipped with coated steel wire safety guards.
- E. Compressor
  - 1. Compressor will be hermetically sealed.
  - 2. Compressor will be mounted on rubber split-post vibration isolators.
  - 3. Compressor will be covered with a sound absorbing blanket.
- F. Condenser Coil
  - 1. Condenser coil will be air cooled.

2. Coil will be constructed of aluminum fins mechanically bonded to copper tubes which are then cleaned,
3. dehydrated, and sealed.
4. Refrigeration Components
5. Refrigeration circuit components will include liquid-line back-seating shutoff valve with sweat connections,
6. vapor-line back-seating shutoff valve with sweat connections, system charge of (R-410A) refrigerant, and compressor oil.
7. Unit will be equipped with high-pressure switch, low pressure switch and filter drier for refrigerant.

END OF SECTION 15700

**SECTION 15830 – TERMINAL UNITS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION OF WORK:**

- A. Extent of terminal unit work is indicated by drawings and schedules, and by requirements of this section.
- B. Types of terminal units required for project include the following:
  - 1. Direct Vented Unit Heaters.
- C. Refer to other Division-15 sections for piping; ductwork; and testing, adjusting and balancing of terminal units; not work of this section.
- D. Refer to Division-16 sections for the following work; not work of this Section.
  - 1. Power supply wiring from power source to power connection on terminal unit. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.
  - 2. Interlock wiring between electrically-operated terminal units; and between terminal units and field-installed control devices.
  - 3. Interlock wiring specified as factory-installed is work of this section.
- E. Provide the following electrical work as work of this section, complying with requirements of Division-16 sections:
  - 1. Control wiring between field-installed controls, indicating devices, and terminal unit control panels.
    - a. Control wiring specified as work of Division-15 for Automatic Temperature Controls is work of that section.

**1.2 QUALITY ASSURANCE:**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of terminal units, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
  - 1. ARI Compliance: Provide coil ratings in accordance with ARI Standard 410

- "Forced-Circulation Air-Cooling and Air-Heating Coils".
2. ASHRAE Compliance: Test coils in accordance with ASHRAE Standard 33 "Methods of Testing Forced Circulation Air Cooling and Heating Coils".
  3. UL Compliance: Provide electrical components for terminal units which have been listed and labeled by UL.

### 1.3 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications for terminal units showing dimensions, capacities, ratings, performance characteristics, gages and finishes of materials, and installation instructions.
- B. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to terminal units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Samples: Submit 3 samples of each type of cabinet finish furnished.
- E. Maintenance Data: Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, shop drawings in maintenance manuals; in accordance with requirements of Division 1.

### 1.4 DELIVERY, STORAGE, AND HANDLING:

- A. Handle terminal units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged terminal units or components; replace with new.
- B. Store terminal units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- C. Comply with Manufacturer's rigging and installation instructions for unloading terminal units, and moving them to final location.

## PART 2 – PRODUCTS

### 2.1 UNIT HEATERS:

**A. General:**

1. Provide all accessories required by the manufacturer for proper installation. Performance shall be as indicated on the equipment schedule in the plans. Unit heater shall be listed by CSA as certified.

- Up to 93% Thermal efficiency
- propane conversion kit included with unit)
- single burner combustion system including a one-piece burner assembly
- Transformer for 24-volt controls
- Integrated circuit board with diagnostic indicator lights
- Multi-try direct ignition with timed lockout
- Fan relay (included on the circuit board)
- Single-stage natural gas valve
- Vibration/noise isolated fan motor
- Sealed control compartment houses all electrical components
- 48 frame, ball bearing, PSC venter motor
- 4-point Suspension
- Built-in disconnect switch (20A @ 115V Rating)
- External terminal strip for 24-volt wiring
- Sealed junction box for supply wiring
- External gas connection
- Fully gasketed door panel with safety door switch
- Full fan guard
- 409 stainless steel primary heat exchanger
- Totally enclosed fan motor (115 V only)

**B. OSHA Fan Guard:**

1. Factory installed wire fan guard shall meet OSHA specifications to guard exposed fan blades when the periphery of the fan blades is less than 8 feet [2.4 meters] from the floor or working area.

**C. Manufacturer: Subject to compliance with requirements, provide unit heaters of one of the following:**

1. Reznor
2. Modine
2. Trane



**PART 3 - EXECUTION**

**3.1 INSPECTION:**

- A. Examine areas and conditions under which terminal units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

**3.2 INSTALLATION OF UNIT HEATERS:**

- A. General: Install unit heaters as indicated, and in accordance with manufacturer's installation instructions.
- B. Locate unit heaters as indicated, coordinate with other trades to assure correct recess size for recessed units.
- C. Install piping as indicated.
- D. Protect units with protective covers during balance of construction.

**3.3 ELECTRICAL WIRING:**

- A. General: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electric Installer.
  - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

**3.4 ADJUSTING AND CLEANING:**

- A. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.
- B. Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

**END OF SECTION 15830**

**SECTION 15850 – MAKE UP AIR UNIT**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.
- B. Requirements of the following Division 15 Sections apply to this section:
  - 1. "Basic Mechanical Requirements."
  - 2. "Basic Piping Materials and Methods."

**1.2 SUMMARY**

- A. This Section includes general duty valves common to most mechanical piping systems.
  - 1. Special purpose valves are specified in individual piping system specifications.

**1.3 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

**1.4 QUALITY ASSURANCE**

- A. Single Source Responsibility: Comply with the requirements specified in Division 1 Section "MATERIALS AND EQUIPMENT."
- B. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
- C. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the various MSS Standard Practices referenced.

**1.5 MAKE UP AIR UNIT**

- A. Units are completely factory assembled, piped, wired and test fired. All units are AGA Certified and conform with the latest ANSI Standards for safe and efficient performance. Units are provided with four point suspension hangers. All units are available for operation on LP (propane) gas.
- B. Casings are die-formed, 20-gauge galvanized steel and finished in baked enamel. The bottom panel is easily removed to provide service access to the burners, pilot and orifices. The pilot is also accessible through a side panel access plate. The high limit switch is accessible through a side panel access. Duct discharge flanges for simple ductwork connection are provided.
- C. Heat exchanger construction and related accessories consists of type 409 stainless steel.
- D. Controls: A factory installed junction box is provided for all power connections. Standard units are provided with a 24-volt combination single-stage automatic gas valve, including main operating valve and pilot safety shutoff, pressure regulator, manual main and pilot shutoff valve, and adjustable pilot valve.. A 24-volt control transformer and a high limit are provided. All units are provided with a solid-state ignition control system which ignites the intermittent pilot by spark during each cycle of operation. When the pilot flame is proven, the main burner valve opens to allow gas flow to the burners. Pilot and burners are extinguished during the off cycle.
- E. Flue Vent Fan: The flue vent fan is factory assembled to a sealed flue collection chamber and provides power venting. The flue vent fan is activated in response to a low voltage (24V) single stage thermostat. A combustion air pressure switch is provided as standard to verify proper powered vent flow prior to allowing the gas valve to operate.
- F. Factory installed options: Two-Stage Gas Valve Provides two stages of heat. Ignition is at low fire (40% of the unit's full rated input). Requires the use of an optional two-stage thermostat. Continuous Fan Relay (Interlock Relay -24V Coil DPDT 10A A relay is provided with 24 volt coil and double-pole, double throw 10 amp contacts. It plugs into the main connection PC board in the electrical cabinet. May also be used as an exhaust fan interlock. Interlock Relay - 24/115V coil SPDT 10A This relay has a selectable coil voltage of 24 or 115 volts and single pole, double-throw 10 amp contacts with an LED on the indicator lamp. The relay is utilized as an auxiliary relay. High/Low Gas Pressure Limit Switches A high pressure and a low pressure interlock switch and shutoff valve shall be provided for each furnace section. High/low gas pressure limits disengage heating upon detecting either high line pressure or low manifold pressure. Status Indicator Lamps (Electrical Cabinet) Status indicator lamps

shall include power on, blower on and one lamp per stage of heat mounted in the electrical cabinet.

- G. Field installed accessories: Manual Reset High Limit Switch. The unit shall be provided with a manual reset, high-limit switch wired in series to the lead furnace high limit. If the setpoint is reached, the gas valve will close and the blower will continue to run until the sensed temperature is below the set point. Low-voltage programmable room thermostat, two-stage with LCD display, fan auto-on switch and system-off-heat-auto-cool switch. A universal tamperproof guard for all room thermostats Room thermostat, electronic modulating control. Duct thermostat, electronic modulating control and filters.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: including and limited too:
1. Reznor
  2. Trane
  3. Modine

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, housekeeping pads, and other conditions affecting performance of fans.
- B. Do not proceed until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Install fans level and plumb, in accordance with manufacturer's written instructions. Support units as described below, using the vibration control devices indicated. Vibration control devices are specified in Division 15 Section "Vibration Controls."
1. Support floor-mounted units on concrete equipment bases using neoprene pads. Secure units to anchor bolts installed in concrete equipment base.

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET  
VOLUNTOWN, CT**

**MAKE UP AIR UNIT**

**15850-4**

Manufacturer's Field Inspection: Arrange and pay for a factory- authorized service representative to perform the following: Procedures and schedules related to start-up and shutdown, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.

END OF SECTION 15850

**SECTION 15870 – POWER VENTILATORS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. This Section includes the following types of power ventilators:

1. Roof mounted exhausters.

**1.2 SUBMITTALS**

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:

1. Product data for selected models, including specialties, accessories, and the following:
  - a. Certified fan performance curves with system operating conditions indicated.
  - b. Certified fan sound power ratings.
  - c. Motor ratings and electrical characteristics plus motor and fan accessories.
  - d. Materials gages and finishes, including color charts.
  - e. Dampers, including housings, linkages, and operators.
2. Shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.
3. Coordination drawings, in accordance with Division 15 Section "Basic Mechanical Requirements," for roof penetration requirements and for reflected ceiling plans drawn accurately to scale and coordinating penetrations and units mounted above ceiling. Show the following:
  - a. Roof framing and support members relative to duct penetrations.
  - b. Ceiling suspension members.
  - c. Method of attaching hangers to building structure.
  - d. Size and location of initial access modules for acoustical tile.
  - e. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.
4. Wiring diagrams that detail power, signal, and control wiring. Differentiate between manufacturer-installed wiring and field- installed wiring.
5. Product certificates, signed by manufacturers of air-handling units, certifying that their products comply with specified requirements.

6. Maintenance data for air-handling units, for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 15 Section "Basic Mechanical Requirements."

### **1.3 QUALITY ASSURANCE**

- A. UL Compliance: Fans shall be designed, manufactured, and tested in accordance with UL 705 "Power Ventilators."
- B. UL Compliance: Fans and components shall be UL listed and labeled.
- C. Nationally Recognized Testing Laboratory and NEMA Compliance (NRTL): Fans and components shall be NRTL listed and labeled. The term "NRTL" shall be as defined in OSHA Regulation 1910.7.
- D. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- E. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."

### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Lift and support units with the manufacturer's designated lifting or supporting points.
- B. Disassemble and reassemble units as required for movement into the final location following manufacturer's written instructions.
- C. Deliver fan units as a factory-assembled unit to the extent allowable by shipping limitations, with protective crating and covering.

### **1.5 SEQUENCING AND SCHEDULING**

- A. Coordinate the installation of roof curbs, equipment supports, and roof penetrations specified in Division 7.
- B. Coordinate the size and location of structural steel support members.

### **1.6 EXTRA MATERIALS**

- A. Furnish one additional complete set of belts for each belt-driven fan.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include but are not limited to, the following:
  - 1. Centrifugal Roof Ventilators:
    - a. Greenheck Fan Corp.
    - b. Cook (Loren) Co.
    - c. Carnes Company, Inc.

### **2.2 SOURCE QUALITY CONTROL**

- A. Testing Requirements: The following factory tests are required:
  - 1 Sound Power Level Ratings: Comply with AMCA Standard 301 "Method for Calculating Fan Sound Ratings From Laboratory Test Data." Test fans in accordance with AMCA Standard 300 "Test Code for Sound Rating." Fans shall be licensed to bear the AMCA Certified Sound Ratings Seal.
  - 2 Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings in accordance with AMCA Standard 210/ASHRAE Standard 51 - Laboratory Methods of Testing Fans for Rating.

### **2.3 FANS, GENERAL**

- A. General: Provide fans that are factory fabricated and assembled, factory tested, and factory finished with indicated capacities and characteristics.
- B. Fans and Shafts: Statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower.
  - 1. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70 percent of the first critical speed at the top of the speed range of the fan's class.
- C. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.
  - 1. Service Factor: 1.4.



- D. Belts: Oil-resistant, nonsparking, and nonstatic.
- E. Motors and Fan Wheel Pulleys: Adjustable pitch for use with motors through 15 HP; fixed pitch for use with motors larger than 15 HP. Select pulley so that pitch adjustment is at the middle of the adjustment range at fan design conditions.
  - 1. Belt Guards: Provide steel belt guards for motors mounted on the outside of the fan cabinet.
- F. Shaft Bearings: Provide type indicated, having a median life "Rating Life" (AFBMA (L(50))) of 200,000, calculated in accordance with AFBMA Standard 9 for ball bearings and AFBMA Standard 11 for roller bearings.
- G. Factory Finish: The following finishes are required:
  - 1. Sheet Metal Parts: Prime coating prior to final assembly.
  - 2. Exterior Surfaces: Baked-enamel finish coat after assembly.

#### **2.4 CENTRIFUGAL ROOF VENTILATORS**

- A. General Description: Belt-driven or direct-drive as required, centrifugal consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; square, one-piece, hinged aluminum base with venturi inlet cone.
  - 1. Up-blast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
- C. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.
- D. Belt-Driven Drive Assembly: Resiliently mounted to the housing, with the following features:
  - 1. Pulleys: Cast-iron, adjustable-pitch.
  - 2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
  - 3. Fan Shaft: Turned, ground, and polished steel drive shaft keyed to wheel hub.
  - 4. Fan and motor isolated from exhaust air stream.
- E. Accessories:

1. Disconnect Switch: Nonfusible type, with thermal overload protection mounted inside fan housing, factory-wired through an internal aluminum conduit.
2. Bird Screens: Removable 1/2-inch mesh, 16-gage, aluminum or brass wire.
3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base, factory set to close when fan stops.
4. Dampers: Motor-operated, parallel-blade, volume control dampers mounted in curb base.
  - a. Blades: Die-formed sheet aluminum.
  - b. Frame: Extruded aluminum, with waterproof, felt blade seals.
  - c. Linkage: Nonferrous metals, connecting blades to counter weight or operator.
  - d. Operators: Manufacturer's standard electric motor.
  - e. Operators: Manufacturer's standard pneumatic motor.
5. Roof Curbs: Prefabricated, heavy-gage, galvanized steel; mitered and welded corners; 2-inch-thick, rigid, fiberglass insulation adhered to inside walls; built-in cant and mounting flange for flat roof decks; and 2-inch wood nailer. Size as required to suit roof opening and fan base.
  - a. Overall Height: 12 inches.

## **2.5 MOTORS**

- A. Torque Characteristics: Sufficient to accelerate the driven loads satisfactorily.
- B. Motor Sizes: Minimum sizes and electrical characteristics as indicated. If not indicated, large enough so that the driven load will not require the motor to operate in the service factor range.
- C. Temperature Rating: 50 deg C maximum temperature rise at 40 deg C ambient for continuous duty at full load (Class A Insulation).
- D. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors.
- E. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design B. Provide permanent-split capacitor classification motors for shaft-mounted fans and capacitor start classification for belted fans.
  1. Bases: Adjustable.
  2. Bearings: The following features are required:
    - a. Ball or roller bearings with inner and outer shaft seals.
    - b. Grease lubricated.
    - c. Designed to resist thrust loading where belt drives or other drives produce

lateral or axial thrust in motor.

3. Enclosure Type: The following features are required:
    - a. Open drip-proof motors where satisfactorily housed or remotely located during operation.
    - b. Guarded drip-proof motors where exposed to contact by employees or building occupants.
  4. Overload protection: Built-in, automatic reset, thermal overload protection.
  5. Noise rating: Quiet.
  6. Efficiency: Energy-efficient motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, Test Method B. If efficiency not specified, motors shall have a higher efficiency than "average standard industry motors" in accordance with IEEE Standard 112, Test Method B.
  7. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, and special features.
- F. Starters, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 16.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, roof curbs, equipment supports, and other conditions affecting performance of fans.
- B. Do not proceed until unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION, GENERAL**

- A. Install fans level and plumb, in accordance with manufacturer's written instructions. Support units as described below, using the vibration control devices indicated. Vibration control devices are specified in Division 15 Section "Vibration Controls."
  1. Support utility set fans on equipment bases and roof supports using neoprene pads. Secure units to anchor bolts installed in equipment base.
  2. Support utility set on equipment bases and roof supports using housed spring isolators. Secure units to anchor bolts installed in equipment base.

3. Secure roof-mounted fans to roof curbs with cadmium-plated hardware.
    - a. Installation of roof curbs is specified in Division 7.
  4. Suspended Units: Suspend units from structural steel support frame using threaded steel rods and vibration isolation springs.
- B. Arrange installation of units to provide access space around air- handling units for service and maintenance.

### 3.3 CONNECTIONS

- A. Duct installations and connections are specified in other Division 15 sections. Make final duct connections with flexible connections.
- B. Electrical Connections: The following requirements apply:
1. Electrical power wiring is specified in Division 16.
  2. Temperature control wiring and interlock wiring are specified in Division 15 Section "Electrical Control Systems."
  3. Temperature control wiring and interlock wiring are specified in Division 15 Section "Pneumatic Control Systems."
  4. Grounding: Connect unit components to ground in accordance with the National Electrical Code.

### 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Inspection: Arrange and pay for a factory- authorized service representative to perform the following:
1. Inspect the field assembly of components and installation of fans including ductwork and electrical connections.
  2. Prepare a written report on findings and recommended corrective actions.

### 3.5 ADJUSTING, CLEANING, AND PROTECTING

- A. Adjust damper linkages for proper damper operation.
- B. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel and cabinet.

### 3.6 COMMISSIONING

- A. Final Checks Before Start-Up: Perform the following operations and checks before

start-up:

1. Remove shipping blocking and bracing.
  2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork, and electrical are complete. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
  3. Perform cleaning and adjusting specified in this Section.
  4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearings operations. Reconnect fan drive system, align belts, and install belt guards.
  5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
  6. Verify manual and automatic volume control and that fire and smoke dampers in connected ductwork systems are in the full-open position.
  7. Disable automatic temperature control operators.
- B. Starting procedures for fans:
1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.
  2. Measure and record motor electrical values for voltage and amperage.
    - a. Replace fan and motor pulleys as required to achieve design conditions.
- C. Shut unit down and reconnect automatic temperature control operators.
- D. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for procedures for air-handling-system testing, adjusting, and balancing.

### 3.7 DEMONSTRATION

- A. Demonstration Services: Arrange and pay for a factory-authorized service representative to train Owner's maintenance personnel on the following:
1. Procedures and schedules related to start-up and shutdown, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
  2. Familiarization with contents of Operating and Maintenance Manuals specified in Division 1 Section "Project Closeout" and Division 15 Section "Basic Mechanical Requirements."
- B. Schedule training with at least 7 days' advance notice.

END OF SECTION 15870

**SECTION 15891 – METAL DUCTWORK**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to this Section.

**1.2 SUMMARY**

- A. This Section includes rectangular and round ducts.

**1.3 QUALITY ASSURANCE**

- A. NFPA Compliance: Comply with the following NFPA Standards:
  - 1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.

**PART 2 - PRODUCTS**

**2.1 SHEET METAL MATERIALS**

- A. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.

**2.2 FIRE-STOPPING**

- A. Refer to Division 7 Section "Firestopping" for fire-stopping.

**2.3 HANGERS AND SUPPORTS**

- A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.
- B. Hangers: Galvanized sheet steel, or round, uncoated steel, threaded rod.
  - 1. Straps and Rod Sizes: Conform with Table 4-1 in SMACNA HVAC Duct Construction Standards, 1985 Edition, for sheet steel width and gage and steel rod diameters.

- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

## **2.4 RECTANGULAR DUCT FABRICATION**

- A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
  - 1. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

## **2.5 RECTANGULAR DUCT FITTINGS**

- A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," 1985 Edition, Figures 2-1 through 2-10.

## **2.6 ROUND DUCT FABRICATION**

- A. General: "Basic Round Diameter" as used in this article is the diameter of the size of round duct that has a circumference equal to the perimeter of a given sized of flat oval duct.
- B. Round Ducts: Fabricate round supply ducts with spiral lockseam construction to elbows being pleated. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.

## **PART 3 - EXECUTION**

### **3.1 DUCT INSTALLATION, GENERAL**

- A. Install ducts with the fewest possible joints.
- B. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.
- C. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.

- D. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.
- E. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- F. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or in soffits.

### **3.2 HANGING AND SUPPORTING**

- A. Install rigid round, and rectangular metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards," Tables 4-1 through 4-3 and Figures 4-1 through 4-8.
- B. Support horizontal ducts within 2 feet of each elbow.
- C. Support vertical ducts at each floor.
- D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specific methods indicated.
- E. Install powder actuated concrete fasteners after concrete is placed and completely cured.

### **3.3 CONNECTIONS**

- A. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 15 Section "Duct Accessories."
- B. Clean ducts systems prior to final acceptance to remove dust and debris.

END OF SECTION 15891



**SECTION 15910 – DUCTWORK ACCESSORIES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION OF WORK:**

- A. Types of ductwork accessories required for project include the following:
  - 1. Dampers.
    - a. Low pressure manual dampers.
    - b. Control dampers.
    - c. Counterbalanced relief dampers.
  - 2. Fire and smoke dampers.
  - 3. Turning vanes.
  - 4. Duct hardware.
  - 5. Duct access doors.
  - 6. Flexible connections.
- B. Refer to other Division-15 sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

**1.2 QUALITY ASSURANCE:**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of ductwork accessories, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
  - 1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".
  - 2. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.
  - 3. UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers".
  - 4. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.

**1.3 SUBMITTALS:**

- A. Product Data: Submit manufacturer's technical product data for each type of ductwork

accessory, including dimensions, capacities, and materials of construction; and installation instructions.

- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of ductwork accessory showing interfacing requirements with ductwork, method of fastening or support, and methods of assembly of components.
- C. Maintenance Data: Submit manufacturer's maintenance data including parts lists for each type of duct accessory. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

## **PART 2 - PRODUCTS**

### **2.1 DAMPERS:**

- A. Low Pressure Manual Dampers: Provide dampers of single blade type or multiblade type, constructed in accordance with SMACNA "HVAC Duct Construction Standards".
- B. Control Dampers: Provide dampers with parallel blades for 2- position control, or opposed blades for modulating control. Construct blades of 16-ga steel, provide heavy-duty molded self- lubricating nylon bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16-ga channel for face areas over 25 sq. ft. Provide galvanized steel finish with aluminum touch-up.
- C. Control Dampers: Refer to Division-15 section "Control Systems" for control dampers; not work of this section.
- D. Counterbalanced Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at indicated static pressure. Construct blades of 16-ga aluminum, provide 1/2" diameter ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16-ga channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame with aluminum touch-up.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering dampers which may be incorporated in the work include, but are not limited to, the following:
  - 1. Air Balance, Inc.
  - 2. Airguide Corp.
  - 3. American Warming & Ventilating, Inc.

4. Arrow Louver and Damper; Div. of Arrow United Industries, Inc. Louvers & Dampers, Inc.
5. Penn Ventilator Co.
6. Ruskin Mfg. Co.

## **2.2 FIRE AND SMOKE DAMPERS:**

- A. Fabricated Fire Dampers: Provide dampers constructed in accordance with SMACNA "Fire Dampers and Heat Stop Guide".
- B. Fire Dampers: Provide fire dampers, of types and sizes indicated. Construct casings of 11-ga galvanized steel with bonded red acrylic enamel finish. Provide fusible link rated at 160 to 165 degrees F (71 to 74 degrees C) unless otherwise indicated. Provide damper with positive lock in closed position, and with the following additional features:
  1. Damper Blade Assembly: Single-blade type.
  2. Damper Blade Assembly: Multi-blade type.
  3. Damper Blade Assembly: Curtain type.
  4. Blade Material: Steel, match casing.
  5. Blade Material: Stainless steel.
- C. Fire/Smoke Dampers: Provide fire/smoke dampers, of types and sizes indicated. Construct casings of 11-ga galvanized steel with bonded red acrylic enamel finish. Provide fusible link rated at 160 to 165 degrees F (71 to 74 degrees C) unless otherwise indicated. Provide additional frangible link containing explosive charge, connected in series with fusible link. Provide stainless steel spring loaded leakage seals in sides of casing, and 36" long wire leads for connecting smoke link to smoke detector, and the following additional features:
  1. Damper Blade Assembly: Single-blade type.
  2. Damper Blade Assembly: Multi-blade type.
  3. Damper Blade Assembly: Curtain type.
  4. Blade Material: Steel, matching casing.
  5. Blade Material: Stainless steel.
- D. Motor-Driven Fire/Smoke Dampers: Provide motor-driven fire/smoke dampers in types and sizes indicated, with casing constructed of 11-ga galvanized steel with bonded red acrylic enamel finish, fusible link 160 to 165 degrees F (71 to 74 degrees C), unless otherwise indicated, and curtain type stainless steel interlocking blades, with electric motor equipped with instant closure clutch, stainless steel cable damper blade linkage, motor mounting bracket, and 32" long wire leads for connecting to smoke detector, and with the following construction features:

1. Unit Assembly: Motor mounted outside air stream.
2. Unit Assembly: Motor mounted inside air stream.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire and smoke dampers which may be incorporated in the work include, but are not limited to, the following:
  1. Air Balance, Inc.
  2. American Warming & Ventilating, Inc.
  3. Arrow Louver and Damper; Div. of Arrow United Industries Inc.
  4. Louvers and Dampers, Inc.
  5. Penn Ventilator Co.
  6. Phillips-Aire
  7. Ruskin Mfg. Co.

### **2.3 TURNING VANES:**

- A. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards".
- B. Manufactured Turning Vanes: Provide turning vanes constructed of 1-1/2" wide curved blades set at 3/4" o.c., supported with bars perpendicular to blades set at 2" o.c., and set into side strips suitable for mounting in ductwork.
- C. Acoustic Turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusion with perforated faces and fiberglass fill.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering turning vanes which may be incorporated in the work include, but are not limited to, the following:
  1. Aero Dyne Co.
  2. Airsan Corp.
  3. Anemostat Products Div.; Dynamics Corp. of America.
  4. Barber-Colman Co.
  5. Duro Dyne Corp.
  6. Environmental Elements Corp.; Subs, Koppers Co., Inc.
  7. Hart & Cooley Mfg. Co.
  8. Register & Grille Mfg. Co., Inc.
  9. Souther, Inc.

### **2.4 DUCT HARDWARE:**

- A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:

1. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.
  2. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering duct hardware which may be incorporated in the work include, but are not limited to, the following:
1. Ventfabrics, Inc.
  2. Young Regulator Co.

## **2.5 DUCT ACCESS DOORS:**

- A. General: Provide where indicated, duct access doors of size indicated.
- B. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one size hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering duct access doors which may be incorporated in the work include, limited to the following:
1. Air Balance Inc.
  2. Ruskin Mfg. Co.
  3. Ventifabrics, Inc.
  4. Zurn Industries, Inc.; Air Systems Div.

## **2.6 FLEXIBLE CONNECTORS:**

- A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibration of connected equipment.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering flexible connections which may be incorporated in the work include, limited to the following:

1. American/Elgen Co.; Energy Div.
2. Flexaust (The) Co.
3. Ventfabrics, Inc.

### **PART 3 - EXECUTION**

#### **3.1 INSPECTION:**

- A. Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

#### **3.2 INSTALLATION OF DUCTWORK ACCESSORIES:**

- A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Install turning vanes in square or rectangular 90 degree elbows in supply and exhaust air systems, and elsewhere as indicated.
- C. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.
- D. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

#### **3.3 FIELD QUALITY CONTROL:**

- A. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leakproof performance.

#### **3.4 ADJUSTING AND CLEANING:**

- A. Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.
  1. Label access doors in accordance with Division-15 section "Mechanical Identification".
  2. Final positioning of manual dampers is specified in Division- 15 section "Testing,

Adjusting, and Balancing".

- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

**3.5 EXTRA STOCK:**

- A. Furnish extra fusible links to Owner, one link for every 10 installed of each temperature range; obtain receipt.

END OF SECTION 15910

**SECTION 15932 – AIR OUTLETS AND INLETS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION OF WORK:**

A. Types of outlets and inlets required for project include the following:

1. Ceiling air diffusers.
2. Wall registers and grilles.
3. Louvers.

**1.2 QUALITY ASSURANCE:**

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air outlets and inlets of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

1. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".
2. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".
3. ADC Compliance: Test and rate air outlets and inlets in certified laboratories under requirements of ADC 1062 "Certification, Rating and Test Manual".
4. ADC Seal: Provide air outlets and inlets bearing ADC Certified Rating Seal.
5. AMCA Compliance: Test and rate louvers in accordance with AMCA 500 "Test Method for Louvers, Dampers and Shutters".
6. AMCA Seal: Provide louvers bearing AMCA Certified Rating Seal.
7. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

**1.3 SUBMITTALS:**

A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:

1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.



2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.
  3. Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature and velocity traverses; throw and drop; and noise criteria ratings. Indicate selections on data.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.
- C. Maintenance Data: Submit maintenance data, including cleaning instructions for finishes, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 1.

#### **1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:**

- A. Deliver air outlets and inlets wrapped in factory-fabricated fiber-board type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.
- B. Store air outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

### **PART 2 - PRODUCTS**

#### **2.1 CEILING AIR DIFFUSERS: (See schedule for additional requirements)**

- A. Materials: Aluminum Construction, diffusers shall be constructed entirely on extruded aluminum.
- B. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
- C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.
- D. Types: Provide ceiling diffusers of type, capacity, and with accessories and finishes as

listed on diffuser schedule. The following requirements shall apply to nomenclature indicated on schedule.

1. Diffuser Faces:
  - a. Round: Round housing, core of concentric rings, round duct connection.
  - b. Half-Round: Semi-circular housing, core of concentric half-rings, rectangular duct connection.
  - c. Square: Square housing, core of square concentric louvers, square or round duct connection.
  - d. Rectangular: Rectangular housing, core of rectangular concentric louvers, square or round duct connection.
  - e. Panel: Square or rectangular housing extended to form a panel to fit in ceiling system module, core of square or rectangular concentric louvers, square or round duct connection.
  - f. Perforated: Round, square, or rectangular housing covered with removable perforated panel in frame. Conceal air pattern devices above panel.
  - g. Linear: Extruded aluminum continuous slot, single or multiple.
2. Diffuser Mountings: AS REQUIRED
  - a. Stepped-Down: Diffuser housing below ceiling with perimeter flange and gasket to seal against ceiling construction.
  - b. Flush: Diffuser housing above ceiling surface with flush perimeter flange and gasket to seal against ceiling.
  - c. Lay-In : Diffuser housing sized to fit between ceiling exposed suspension tee bars and rest on top surface of tee bar.
  - d. Snap-In: Diffuser housing sized to fit between ceiling concealed suspension runners, and snap into runners.
3. Diffuser Patterns: AS REQUIRED
  - a. Fixed: Fixed position core with concentric rings or louvers for radial air flow around entire perimeter of diffuser.
  - b. 2 Position: Manual 2-position core with concentric rings or louvers, upper position for horizontal air flow, lower position for vertical air flow.
  - c. Adjustable: Manual adjustable core with concentric rings or louvers, fully adjustable for horizontal to vertical air flow.
  - d. Supply and Return: 2-section core, center position for return, perimeter for supply.
  - e. 1 Way: Fixed louver face for 1-direction air flow, direction indicated on drawings.
  - f. 2 Way: Fixed louver face for 2-direction air flow, directions indicated on drawings.
  - g. 3 Way: Fixed louver face for 3-direction air flow, directions indicated on

- drawings.
  - h. 4 Way: Fixed louver face for 4-direction air flow, directions indicated on drawings.
  - i. Induction: Internal aspirator designed to mix air drawn into center core with conditioned air.
  - j. Rearrangeable Core: Modular directional core which can be rearranged for selected air pattern.
4. Diffuser Dampers:
- a. Opposed Blade: Adjustable opposed blade damper assembly, key operated from face of diffuser.
  - b. Butterfly: Two semicircular flaps connected to linkage adjustable from face of diffuser with key, and with straightening grid.
  - c. Supply and Return: For supply and return diffusers, butterfly type damper in return neck, annular adjustable dampers in supply duct.
  - d. Integral: Combination volume control and pattern adjustment for linear diffusers.
  - e. Fire Damper: Combination adjustable opposed blade damper and fusible link fire damper with UL approved link and assembly designed to meet requirements of NFPA 90A.
5. Diffuser Accessories:
- a. Equalizing Deflectors: Adjustable parallel blades in frame for straightening air flow.
  - b. Smudge Ring: Extension perimeter frame around diffuser, sized so induced air impinges on frame and not on ceiling.
  - c. Plaster Ring: Perimeter ring designed to act as a plaster stop and diffuser anchor.
  - d. Extractor: Curved blades mounted on adjustable frame to produce air scooping action in duct at diffuser take-off.
  - e. Blank-Off Baffles: Arc segments designed to fit into diffuser housing to divert air flow from impinging on obstruction.
  - f. Operating Keys: Tools designed to fit through diffuser face and operate volume control device and/or pattern adjustment.
6. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work limited to the following:
- 1. Metal-Aire
  - 2. Price
  - 3. Titus Products Div.; Philips Industries, Inc.

## 2.2 WALL REGISTERS AND GRILLES:

- A. General: Except as otherwise indicated, provide manufacturer's standard wall registers and grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide wall registers and grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.
- C. Wall Compatibility: Provide registers and grilles with border styles that are compatible with adjacent wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction which will contain each type of wall register and grille.
- D. Types: Provide wall registers and grilles of type, capacity, and with accessories and finishes.
  - 1. Register and Grille Materials:
    - a. Aluminum Construction: Manufacturer's standard extruded aluminum frame and adjustable blades.
  - 2. Register and Grille Faces: AS REQUIRED
    - a. Horizontal Straight Blades: Horizontal blades, individually adjustable, at manufacturer's standard spacing.
    - b. Vertically Straight Blades: Vertical blades, individually adjustable, at manufacturer's standard spacing.
    - c. Horizontal 45 Degree Fixed Blades: Horizontal blades, fixed at 45 degrees, at manufacturer's standard spacing.
  - 3. Register and Grille Patterns:
    - a. Single Deflection: 1-set of blades in face.
    - b. Double Deflection: 2-sets of blades in face, rear set at 90 degrees to face set.
  - 4. Register and Grille Dampers:
    - a. Opposed Blade: Adjustable opposed blade damper assembly, key operated from face of register
    - b. Opposed Blade Fusible Link: Opposed blade damper with spring closing and UL-listed fusible link for 160 degrees F (71 degrees C).
  - 5. Register and Grille Accessories:

- a. Extractor: Curved blades mounted on adjustable frame to produce air scooping action in duct at register or grille take-off.
  - b. Plaster Frame: Perimeter frame designed to act as plaster stop and register or grille anchor.
  - c. Operating Keys: Tools designed to fit through register or grille face and operate volume control device and/or pattern adjustable.
6. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work limited to the following:
1. Metal-Aire
  2. Price
  3. Titus Products Div.; Philips Industries, Inc.

### 2.3 LOUVERS:

- A. General: Except as otherwise indicated, provide manufacturer's standard louvers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide louvers that have minimum free area, and maximum pressure drop of each type as listed in manufacturer's current data, complying with louver schedule.
- C. Substrate Compatibility: Provide louvers with frame and sill styles that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate support, for weatherproof installation. Refer to general construction drawings and specifications for types of substrate which will contain each type of louver.
- D. Materials: Construct of aluminum extrusions, ASTM B 221, Alloy 6063-T52. Weld units or use stainless steel fasteners.
- E. Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames.
- F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering louvers which may be incorporated in the work include, but are not limited to, the following:
- G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:
  1. Metal-Aire

2. Price
3. Ruskin Mfg. Co.

### **PART 3 - EXECUTION**

#### **3.1 INSPECTION:**

- A. Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION:**

- A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.
- B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
- C. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling module.

#### **3.3 SPARE PARTS:**

- A. Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that require them.

**END OF SECTION 15932**

**SECTION 15990 – TESTING ADJUSTING AND BALANCING**

**PART 1    GENERAL**

**1.1 SUMMARY**

- A.    Scope: Extent of testing, adjusting and balancing work required by this Section.
- B.    Systems: Testing, adjusting and balancing specified in this Section includes the following systems.
  - 1.    Exhaust fans
  - 2.    Unit heaters
  - 3.    Furnace
  - 4.    Make up air unit
  - 3.    Verify temperature control system operations

**1.2 QUALITY ASSURANCE**

- A.    Tester's Qualifications: A specialist certified by the National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC) with at least 3 years of experience in those testing, adjusting and balancing requirements similar to those required for this project, who is not the installer of the system to be tested and is otherwise independent of the project.
- B.    Codes and Standards: Provide testing, adjusting and balancing conforming to American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), American National Standards Institute (ANSI), and either NEBB or AABC the following:
  - 1.    American National Standards Institute (ANSI): Comply with the following:
    - a.    S1.4          Specification For Sound Level Meters
    - b.    S1.11        Specification for Octave-Band and Frcational-Octave-Band Analog and Digital Filters
  - 2.    American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE): Comply with ASHRAE recommendations pertaining to measurements, instruments, and testing, adjusting, and balancing.
  - 3.    NEBB or AABC: Comply with NEBB'S "Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems" or comply with AABC MN-1 "National Standards," as applicable to mechanical air and hydronic distribution systems, and associated equipment and apparatus.

- C. Penalty: The Contractor shall submit the name of the organization he proposes to employ for approval within 45 days after contract award. If the Contractor fails to submit the name of an acceptable agency within the specified time, a firm may be selected to accomplish the work, and this selection shall be binding upon the Contractor at no additional cost.
- D. Calibration of Testing Instruments: All measurement instruments used for testing, adjusting, balancing, and commissioning shall be calibrated. The time between the most recent calibration data and the final test report date shall not be over 3 years.

### **1.3 SUBMITTALS**

- A. Test Reports: Provide certified test reports, signed by the test and balance supervisor who performed the work. In addition, have the reports certified by a Professional Engineer who is familiar with testing and balancing and the project, and is registered in the jurisdiction where testing is being conducted. The final reports shall include identification and types of instruments used, and their most recent calibration date and calibration date.
- B. Standards: The Contractor shall deliver a copy of either NEBB or AABC standards for testing and balancing work associated with the project. This document shall serve as specific guidance to construction engineers as to minimum requirements.
- C. Maintenance Data: Include, in maintenance manuals, copies of certified test reports and identification of instruments.
- D. Qualifications: The Contractor shall submit the certified individual qualifications of all persons responsible for supervising and performing the actual work, the name of the certifying engineer, and the qualifications of the independent Registered Professional Engineer certifying the report.

### **1.4 AGENDA**

- A. Agenda: A preliminary report and agenda shall be submitted and approved prior to the start of testing and balancing work.
  - 1. Review plans and specifications prior to installation of any of the affected systems, and submit a report indicating any deficiencies in the systems that would preclude the proper adjusting, balancing, and testing of the systems.
  - 2. The agenda shall include a general description of each air and water system with its associated equipment and operation cycles for heating, intermediate, and cooling.
  - 3. The agenda shall include a list of all air and water flow and air terminal measurements to be performed.



4. The agenda shall incorporate the proposed selection points for sound measurements, including typical spaces as well as sound sensitive areas like conference rooms.
5. The agenda shall also include specific test procedures and parameters for determining specified quantities (e.g. flow, drafts, sound levels) from the actual field measurements to establish compliance with contract requirements. Samples of forms showing application of procedures and calculations to typical systems shall be submitted.
6. Specific test procedures for measuring air quantities at terminals shall specify type of instrument to be used, method of instrument application (by sketch) and factors for:
  - a. Air terminal configuration.
  - b. Flow direction (supply or exhaust).
  - c. Velocity corrections.
  - d. Effective area applicable to each size and type of air terminal.
  - e. Density corrections.
7. The agenda shall include identification and types of measurement instruments to be used, and their most recent calibration date and calibration date.

## **1.5 JOB CONDITIONS**

- A. General: Do not proceed with testing, adjusting and balancing work until the following conditions have been met.
  1. Work has been completed and is operable. Ensure that there is no latent residual work yet to be completed on the tested equipment.
  2. Work scheduled for testing, adjusting and balancing is clean and free from debris, dirt and discarded building materials.
  3. All architectural openings (doors, windows, and other openings) which may affect the operation of the system to be tested, adjusted, and balanced shall at their normal states.
  4. All related mechanical systems which may affect the operation of the system to be tested, adjusted, and balanced shall be at their normal operating conditions.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS (Not Used)**

### **2.2 PATCHING MATERIALS**

- A. Material: Seal, patch and repair ductwork, piping and equipment drilled or cut for testing purposes.

1. Plastic plugs with retainers may be used to patch drilled holes in ductwork and housings.
2. Piping shall be capped with materials the same as the piping system.
3. Insulation shall be neatly hemmed with metal or plastic edging, leaving test points visible for future testing.

## **2.3 TEST INSTRUMENTS**

- A. Standards: Utilize instruments and equipment of type, precision, and capacity as recommended in the following standards:
  1. NEBB "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
  2. AABC Manual MN-1.
- B. Test Instruments: All instruments used for measurements shall be accurate and calibration histories for each instrument shall be available for examination. Each test instrument shall be calibrated by an approved laboratory or by the manufacturer. A representative has the right to request instrument recalibration, or the use of other instruments and test methodology, where accuracy of readings is questionable.
- C. Additional Instruments: Permanently installed measuring instruments, such as temperature and pressure gauges, shall be checked against transfer standard instruments. Any instrument which does not meet specification requirement shall be replaced or recalibrated.
- D. Cone Instruments: The Contractor shall employ manufactured enclosure type cones, capable of air volume direct readings, for all diffuser air flow measurements. The readout meters shall meet calibration requirements.

## **PART 3 EXECUTION**

### **3.1 PROCEDURES AND INSTRUMENTS, GENERAL**

- A. Requirements: All systems and components thereof shall be adjusted to perform as required.
- B. Test Duration: Operating tests of heating and cooling coils, fans, and other equipment shall be of not less than four hours duration after stabilized operating conditions have been established. Capacities shall be based on temperatures and air and water quantities measured during such tests.

- C. Instrumentation: Method of application of instrumentation shall be in accordance with the approved agenda.
  - 1. All instruments shall be applied in accordance with the manufacturer's certified instructions.
  - 2. All labor, instruments, and appliances required shall be furnished by the Design Builder. Permanently installed instruments used for the tests (e.g., flow meters and Btu meters) shall not be installed until the entire system has been cleaned and ready for operation.
  - 3. See Section 15130, "Meters and Gauges" for thermometer accuracy requirements.

### **3.2 AIR SYSTEMS PROCEDURES**

- A. Adjustments: Adjust all air handling systems to provide approximate design air quantity to or through, each component, and to maintain stable and comfortable interior temperatures, free of drafts or stagnant conditions. Adjusting and balancing of all systems shall be conducted during periods of the year approximating maximum seasonal operation.
- B. Equalizers: Equalizing devices shall be adjusted to provide uniform velocity across the inlets (duct side for supply) of terminals prior to measuring flow rates.
- C. Balance: Flow adjusting (volume control) devices shall be used to balance air quantities (i.e., proportion flow between various terminals comprising system) to the extent that their adjustments do not create objectionable air motion or sound (i.e., in excess of specified limits).
  - 1. Balancing between runs (submains, branch mains, and branches) generally shall be accomplished by flow regulating devices at, or in, the divided-flow fitting.
  - 2. Restriction imposed by flow regulating devices in or at terminals shall be minimal. Final measurements of air quality shall be made after the air terminal has been adjusted to provide the optimum air patterns of diffusion.
- D. Fan Adjustment: Total air system quantities, generally, shall be varied by adjustment of fan speeds or axial-flow fan wheel blade pitch. Damper restriction of a system's total flow may be used only for systems with direct-connected fans (without adjustable pitch blades), provided system pressure is less than 1/2-inch W.G. and sound level criteria is met.
- E. Air Measurement: Where air quantity measuring devices are specified in other sections such systems shall be used as a cross-check of portable measuring equipment.

1. Except as specifically indicated herein, pitot tube traverses shall be made of each duct to measure air flow therein. Pitot tubes, associated instruments, traverses, and techniques shall conform to the ASHRAE "Handbook Fundamentals Inch Pound Edition."
  2. For ducts serving modular office areas with movable partitions, which are subject to change, pitot tube traverses may be omitted provided the duct serves only a single room or space and its design volume is less than 2000 cfm. In lieu of pitot tube traverses, air flow in the duct shall be determined by totalling volume of individual terminals served, measured as described herein.
  3. Where duct's design velocity and air quantity are both less than 1000 (fpm/cfm), air quantity may be determined by measurements at terminals served.
- F. Test Holes: Test holes shall be in a straight duct, as far as possible downstream from elbows, bends, take-offs, and other turbulence generating devices, to optimize reliability of flow measurements.
- G. Air Terminal Balancing: Generally, measurement of flow rates by means of velocity meters applied to individual terminals, with or without cones or other adapters, shall be used only for balancing. Measurement of air quantities at each type of air terminal (inlet and outlet) shall be determined by the method approved for the balancing agenda. Laboratory tests shall be conducted to prove of methodology when so directed. Such tests shall be conducted in conformance with applicable ASHRAE or American Society of Mechanical Engineers (ASME) codes and shall be made at no cost.
- H. Air Motion: Air motion and distribution shall be as required. The Design Builder at no additional cost shall, in addition to air motion measurements, make smoke tests wherever requested to demonstrate the air distribution from air terminals.

### **3.3 HEAT EXCHANGER CAPACITY VERIFICATION**

- A. Air coil capacities shall be verified from air side measurement data. Capacities of coils shall be the difference of the energy carried by the air between the up stream and down stream of the coils.
- B. The measured air flow rate for the fan may be used for air coil capacity calculations providing no ducted bypassing of coil is occurring.
- C. Capacity verifications shall be performed after air and water systems have been balanced.
- D. False load shall be applied if the upstream air or water does not meet the specified

conditions at the time of test.

### 3.5 SOUND TEST PROCEDURES

- A. Scope: Tests of sound levels shall be made at each selection point included in the agenda.
- B. Timing: Sound level measurements shall be taken at times when the building is unoccupied, or when activity in surrounding areas and background noise level in areas tested are at a minimum and relatively free from sudden changes in noise levels.
  - 1. Measurements shall be taken with all equipment turned off, except that being tested.
  - 2. The required sound levels shall be measured at any point within a room not less than 6 feet from an air terminal or room unit, and not closer than 3 feet from any floor, wall, or ceiling surface.
- C. Meters: Sound levels shall be measured with a sound meter complying with ANSI S1.4. The "A" scale shall be used to measure over all sound levels. To determine the specified octave band levels, the above sound level meter, set on "C" scale, shall be supplemented by an octave band analyzer complying with ANSI S1.11.
- D. Equipment Components: The "Equipment Component" of room sound equals LPt-C. The "Equipment Component" of room sound (noise) levels shall be determined for each of eight octave bands as follows.
  - 1. Measure room sound pressure level "LPb" with equipment to be tested shut off.
  - 2. Measure room sound pressure level "LPt" with equipment to be tested turned on.
  - 3. Calculate LPt-LPb; if this value is less than 1, applicable test must be rerun with lower background level (LPb) unless LPt is within sound pressure level specified for equipment.
  - 4. Determine "c" from the table below:

| LPt-LPb (db) | c (db) |
|--------------|--------|
| 1            | 7      |
| 2            | 4      |
| 3            | 3      |
| 4 to 4-1/2   | 2      |
| 5 to 5-1/2   | 1-1/2  |
| 6 to 7-1/2   | 1      |
| 8 to 12      | 1/2    |
| over 12      | 0      |

### **3.6 CERTIFIED REPORTS**

- A. Submittals: Three copies of the reports described herein, covering air and water system performance, air motion (fpm), and sound pressure levels, shall be submitted prior to final tests and inspection.
- B. Instrument Records: Types, serial numbers, and dates of calibration of all instruments shall be included.
- C. Reports: Reports shall conspicuously identify items not conforming to contract requirements, or obvious maloperation and design deficiencies.
- D. Certification: The reports shall be certified by an independent Registered Professional Engineer who is versed in the field of air and water balancing and who is not affiliated with any firm involved in the design or construction phases of the project. Certification shall include checking of adherence to agenda, of calculations, of procedures, and evaluation of final summaries.

### **3.7 AIR SYSTEM DATA**

- A. Report: The certified report shall include for each air handling system the data listed below.
  - 1. Equipment (Fan or Factory Fabricated Station Unit):
    - a. Installation data
      - (a) Manufacturer and model
      - (b) Size
      - (c) Arrangement, discharge and class
      - (d) Motor hp, voltage, phase, cycles, and full load amps
      - (e) Location and local identification data
    - b. Design data
      - (a) Data.
    - c. Fan recorded (test) data
      - (a) cfm
      - (b) Static pressure
      - (c) rpm
      - (d) Motor operating amps motor operating bhp
  - 2. Duct Systems:
    - a. Duct air quantities (maximum and minimum) - main, submains, branches, outdoor (outside) air, total air, and exhaust
      - (a) Duct size(s)
      - (b) Number of Pitot tube (pressure measurements)

- (c) Sum of velocity measurements (Note: Do not add pressure measurements)
  - (d) Average velocity
  - (e) Recorded (test) cfm design cfm
- b. Individual air terminals
  - (a) Terminal identification supply or exhaust, location and number designation
  - (b) Type size, manufacturer and catalog identification applicable factor for application, velocity, area, etc., and designated area
  - (c) Design and recorded velocities- fpm (state "core," "inlet," etc., as applicable)
  - (d) Design and recorded quantities -cfm deflector vane or diffusion cone settings

### **3.8 SOUND DATA**

- A. Report: The certified report shall record data on sound levels, taken at each selected location, as follows.
  - 1. Source of sound and location
  - 2. Diagram or description of relationship of sound source to measuring instrument
  - 3. "A" scale readings equipment being tested turned off (ambient) equipment being tested turned on (operating conditions)
  - 4. Readings at each specified octave band frequency equipment being tested turned off (ambient) equipment being tested turned on (operating conditions)
  - 5. "Equipment Components" of sound (noise) levels with applicable calculations per "Sound Test Procedures"
  - 6. Graph showing relationship between pressure levels specified and recorded readings
- B. Retest: Subsequent to any correctional construction work, such as acoustic corrections, measurement shall be made to verify that associated air and water quantities, as previously measured, have not been disrupted.
  - 1. Certified report shall record all sound data, and their locations, after final adjustments of air and water systems involves.

### **3.9 FINAL COMMISSIONING TESTS, INSPECTIONS AND ACCEPTANCE**

- A. Scope: Test shall be made to demonstrate that capacities and performance of air and water systems comply with contract requirements.
  - 1. At the time of final inspection, the Design Builder shall recheck, random selection of data (air quantities, air motion, and sound levels) recorded in the certified report.
  - 2. Points and areas for recheck shall be selected by the commissioning team.
  - 3. Measurement and test procedures shall be the same as approved for work forming basis of certified report.
  - 4. Selections for recheck (specific plus random), in general, will not exceed 25 percent of

the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.

- B. Retests: If random tests elicit a measured flow deviation of 10 percent or more from, or a sound level of 2 db or more greater than, that recorded in the certified report listings, as 10 percent or more of the rechecked selections, the report shall be automatically rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, new certified reports submitted, and new inspection tests made, all at no additional cost. Retainage time shall be based on the date of the final acceptance of the certified report.
- C. Marking of Settings: Following final acceptance of certified reports, the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently marked by the Design Builder so that adjustment can be restored if disturbed at any time. Devices shall not be marked until after final acceptance.

END OF SECTION 15990



**SECTION 16010 – BASIC ELECTRICAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. This Section includes general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section:

1. Submittals.
2. Coordination drawings.
3. Record documents.
4. Maintenance manuals.
5. Rough-ins.
6. Electrical installations.
7. Cutting and patching.

**1.2 SUBMITTALS**

A. Increase, by the quantity listed below, the number of electrical related shop drawings, product data, and samples submitted, to allow for required distribution plus two copies of each submittal required.

1. Shop Drawings - Initial Submittal: 1 additional blue- or black-line prints.
2. Shop Drawings - Final Submittal: 1 additional blue- or black-line prints.
3. Product Data: 1 additional copy of each item.
4. Samples: 1 addition as set.

B. Additional copies may be required by individual sections of these Specifications.

**1.3 QUALITY CONTROL**

A. Functional and Operational Test Procedure:

1. Test procedure to completely test all systems as to their functional and sequential operation.
2. Submit two (2) draft copies for review before conducting test.
3. Certify that the test procedure was used and testing completed, and that all systems are operational and functioning properly.
4. Submit certified Test Procedure for review prior to the date of final inspection.
5. Systems to be covered by test procedure:
  - a. Power distribution

- b. Lighting systems including general lighting
- c. Fire Alarm systems
- d. Emergency power/inverter systems
- e. Grounding systems
- f. Communication systems

**B. Other Tests and Certifications for:**

- 1. Grounding System: As specified under Section 16452.

**1.4 DEFINITIONS AND ABBREVIATIONS**

- A. Electrical Definitions: As defined by NEC, Article 100.
- B. The term "indicated" shall mean "as shown on contract documents (specifications, drawings, and related attachments)".
- C. The term "provide" shall mean "to furnish, install and connect completely".
- D. The term "size" shall mean one or more of the following: "length, current and voltage rating, number of poles, NEMA size, and other similar electrical characteristics".
- E. The term "space" on panelboard and switchboard schedules shall mean "provide space to install the number of poles and size of the protective device indicated with all the necessary buss and fittings to install the device at some future date".

**1.5 SCHEDULING**

- A. Coordinate electrical work with other divisions of this project.
- B. Coordinate electrical work with Owner.
- C. Written requests for approval for planned shutdowns or interruption of Owner's operation or equipment shall be made 72 hours prior to the start of the requested periods.
- D. Written notification for on site training of Owner's personnel shall be made 1 week prior to the start of the requested training period.

**1.6 COORDINATION DRAWINGS**

- A. Prepare coordination drawings to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate

locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Indicate the proposed locations of major raceway systems, equipment, and materials. Include the following:
  - a. Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
  - b. Exterior wall and foundation penetrations.
  - c. Fire-rated wall and floor penetrations.
  - d. Equipment connections and support details.
  - e. Sizes and locations of required concrete pads and bases.
2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
4. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, cable trays, and other ceiling-mounted devices.

#### 1.7 RECORD DOCUMENTS

- A. Prepare record documents installed conditions for:
  1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
  2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
  3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
- B. Engage the services of a Land Surveyor or Professional Engineer registered in the state in which the project is located to record the locations and invert elevations of underground installations.

#### 1.8 MAINTENANCE MANUALS

- A. Prepare maintenance manuals including the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. As specified under other RELATED SECTIONS; Comparable manufacturers may be utilized, and include the following:
  1. Eaton Corporation
  2. General Electric
  3. Siemens
  4. Square D
- B. As specified on Drawings.

#### 2.2 MATERIAL

- A. General:
  1. Unless otherwise indicated, all raceways for service, feeders, branch and control wiring shall be RSC or IMC. See Section 16110.
  2. Unless otherwise indicated, wiring to vibrating equipment and motors shall be installed in liquid-tight flexible conduit, or in interior locations in flexible metal conduit, with a maximum length of six (6) feet.
  3. Unless otherwise indicated, all conductors to be copper THHN/THWN-2.
  4. Unless otherwise indicated, all outlet and switch boxes to be cast iron with threaded hubs.

5. In interior protected locations, where recessed in ceiling and walls, outlet and switch boxes may be stamped steel.
6. Unless otherwise indicated, provide heavy duty grade, 20 ampere, receptacles and switches. Color by Architect. Plates shall be 302 stainless steel, satin finish, unless otherwise indicated. Plates for surface mounted interior boxes in unfinished areas may be stamped steel. Plates exposed to weather or water shall be metal, weatherproof type.

B. As specified on Drawings.

### 2.3 EQUIPMENT

A. General:

1. Unless otherwise indicated, externally operated safety switches are unfused, solid neutral, heavy duty, and selected to meet the load requirements.

B. As specified on Drawings.

### 2.4 FABRICATION

A. General:

1. Unless otherwise indicated, all enclosures are NEMA Type 1. NEMA Type 3R to be utilized in all wet/damp locations.
2. Unless otherwise indicated, all exterior enclosures to be NEMA 3R.

B. As specified on Drawings.

## PART 3 - EXECUTION

### 3.1 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Contractor is to provide connections, both power and control as noted and as required, for all HVAC equipment and related services. Coordinate with Division 15.
- C. Contractor is to provide connections, both power and control as noted and as required, for modular furniture. Division 16 shall coordinate the respective installations with the supplier and agency.

**3.2 ELECTRICAL INSTALLATIONS**

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
1. Coordinate electrical systems, equipment, and materials installation with other building components.
  2. Verify all dimensions by field measurements.
  3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
  4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
  5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
  6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
  7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
  8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible.
  9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
  10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
  11. Install access panel or doors where units are concealed behind finished surfaces.
  12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
  13. Electrical plans, details, and diagrams show the general location and arrangement of electrical systems. They are diagrammatic and do not show all conduit bodies, connectors, bends, fittings, hangers, and additional pull and junction boxes which the Contractor must provide to complete the electrical system.
  14. Measurement from above finished floor (AFF) shall be taken from the finished floor surface to the top of wall receptacles and switch boxes, to the centerline of wall lighting outlet boxes, to the top of wall mounted equipment enclosures, to the centerline of top most switch handle, or to the lowest surface of ceiling

lighting fixtures and other ceiling mounted equipment. Refer to architectural drawings for mounting heights.

- a. Unless otherwise indicated, wall switch boxes shall be 46 inches AFF.
  - b. Unless otherwise indicated, receptacle boxes shall be 18 inches AFF. Receptacle mounted above counter and at equipment locations shall be coordinated with architectural elements and manufacturer requirements. Coordinate with Architect.
15. Coordinate connection of electrical systems with incoming utilities and services. Comply with requirements of governing regulations, power, telephone, data service companies, and controlling agencies. Provide required connection for each service. Provide power connection to equipment. Coordinate with other Divisions.
16. Conduit Sizing:
- a. Unless otherwise indicated, conduit size for indicated conductor shall be based on Chapter 9 of NEC.
  - b. Minimum conduit size: 1/2 inch.
17. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Measure and locate placement of equipment and materials in relation to building structure and surfaces, and between equipment to be installed and wired. Maintain required minimum access spacing for equipment and enclosures.

### 3.3 PERMITS AND INSPECTIONS

- A. Obtain and pay for all required permits and arrange for all required inspections in accordance with all state and local governing authorities.
- B. Final Electrical Inspection Certificate from inspection agency or governing authority.

### 3.4 FIELD QUALITY CONTROL

- A. Perform field tests as specified under other electrical sections.
- B. Arrange for local Inspection Authorities to inspect work performed prior to burial, closing-in behind wall and above ceiling, or encased in concrete. Also arrange for final inspection of work and obtain Final Inspection Certificate before final inspection of work by Owner or his representative.

**3.5 PROTECTION**

- A. Protect personnel from coming in contact with live parts.
- B. Protect from damage and theft equipment and materials provided or supplied by others in accordance with manufacturer's recommendation and warranties, and with electrical standards and practices.

**3.6 ADDITIONAL WORK**

- A. Provide power and control wiring and conduit for HVAC systems.
- B. Provide temporary electric service power outlets and lighting during construction.
- C. Provide building fire alarm system.
- D. Provide connections for power and controls where noted to mechanical equipment being supplied under other divisions.
- E. Provide power and control wiring and conduit to exhaust equipment and fire suppression systems.
- F. Provide power and control wiring and conduit to kitchen equipment, kitchen exhaust hood and make-up air systems, kitchen fire suppression systems.
- G. Provide 'Wiremold' surface mounted raceway for all finished areas where wiring/conduit cannot be concealed behind finished surfaces.
- H. Provide telecommunication system outlets, wiring and conduits.

**3.7 CUTTING AND PATCHING**

- B. General: Perform cutting and patching in accordance the following requirements:
  - 1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
    - a. Uncover Work to provide for installation of ill-timed Work.
    - b. Remove and replace defective Work.
    - c. Remove and replace Work not conforming to requirements of the Contract Documents.
    - d. Remove samples of installed Work as specified for testing.
    - e. Install equipment and materials in existing structures.



- f. Upon written instructions from the Owner/Owner's Representative, uncover and restore Work to provide for Owner/Owner's Representative observation of concealed Work.
- 2. Cut, remove, and legally dispose of electrical equipment, components, and materials made obsolete by the new Work.
- 3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- 4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- 5. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- 6. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
- 7. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

END OF SECTION 16010

**SECTION 16050 – BASIC ELECTRICAL MATERIALS AND METHODS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes general construction materials and methods for application with electrical installations as follows:
  - 1. Selective demolition including:
    - a. Nondestructive removal of materials and equipment for reuse or salvage.
    - b. Dismantling electrical materials and equipment made obsolete by these installations.
  - 2. Excavation for underground utilities and services, including underground raceways, vaults, and equipment.
  - 3. Miscellaneous metals for support of electrical materials and equipment.
  - 4. Wood grounds, nailers, blocking, fasteners, and anchorage for support of electrical materials and equipment.
  - 5. Joint sealers for sealing around electrical materials and equipment; and for sealing penetrations in fire and smoke barriers, floors, and foundation walls.
  - 6. Access panels and doors in walls, ceilings, and floors for access to electrical materials and equipment.

**1.2 SUBMITTALS**

- A. General: Submit the following:
- B. Product data for the following products:
  - 1. Access panels and doors.
  - 2. Joint sealers.
- C. Shop drawings detailing fabrication and installation for metal fabrications, and wood supports and anchorage for electrical materials and equipment.
- D. Coordination drawings for access panel and door locations in accordance with Division 16 Section "Basic Electrical Requirements."
- E. Samples of joint sealer, consisting of strips of actual products showing full range of colors available for each product.

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PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT BASIC ELECTRICAL MATERIALS AND METHODS 16050-2**

- F. Welder certificates, signed by Design Builder, certifying that welders comply with requirements specified under "Quality Assurance" article of this Section.
- G. Schedules indicating proposed methods and sequence of operations for selective demolition prior to commencement of Work. Include coordination for shut-off of electrical service, and details for dust and noise control.
  - 1. Coordinate sequencing with construction phasing and Owner.

**1.3 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer for the installation and application joint sealers, access panels, and doors.
- B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. Fire-Resistance Ratings: Where a fire-resistance classification is required, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL "Building Materials Directory" for rating.
  - 1. Provide UL Label on each fire-rated access door.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver joint sealer materials in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle joint sealer materials in compliance with the manufacturers' recommendations to prevent their deterioration and damage.

**PART 2 - PRODUCTS**

**2.1 MISCELLANEOUS METALS**

- A. Steel plates, shapes, bars, and bar grating: ASTM A 36.

- B. Cold-Formed Steel Tubing: ASTM A 500.
- C. Hot-Rolled Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Schedule 40, welded.
- E. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, recommended for interior and exterior applications.
- F. Fasteners: Zinc-coated, type, grade, and class as required.

## **2.2 MISCELLANEOUS LUMBER**

- A. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 3 Common or Standard Grade boards complying with WCLIB or AWPB rules, or Number 3 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent.
- B. Construction Panels: Plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less than 15/32 inches.

## **2.3 JOINT SEALERS**

- A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.
- B. Colors: As selected by the Owner/Owner's Representative from manufacturer's standard colors.
- C. Elastomeric Joint Sealers: Provide the following types:
  - 1. One-part, nonacid-curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer.
  - 2. One-part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes.

3. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
  - a. One-Part, Nonacid-Curing, Silicone Sealant:
    - 1) Bostik - "Chem-Caulk 2000,"
    - 2) Dow Corning - "Dow Corning 790"
    - 3) Pecora Corp. - "864NST,"
  - b. One-Part, Mildew-Resistant, Silicone Sealant:
    - 1) Dow Corning – "Dow Corning 786"
    - 2) GE - "SCS 1702"
    - 3) Pecora Corp. – "898"
- D. Acrylic-Emulsion Sealants: One-part, nonsag, mildew-resistant, paintable complying with ASTM C 834 recommended for exposed applications on interior and protected exterior locations involving joint movement of not more than plus or minus 5 percent.
  1. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
    - a. Bostik - "Chem-Calk 600"
    - b. Pecora Corp. - "AC-20"
    - c. Tremco - "Tremflex 834" .
- E. Fire-Resistant Joint Sealers: Two-part, foamed-in-place, silicone sealant formulated for use in through-penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire- rated walls and floors. Sealants and accessories shall have fire- resistance ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters' Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.
  1. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
    - a. Dow Corning - "Dow Corning Fire Stop Foam"
    - b. GE - "Pensil 851"
    - c. Hilti - "CP-620 Fire Stop Foam"

## 2.4 ACCESS DOORS

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96 GATE STREET**

**VOLUNTOWN, CT BASIC ELECTRICAL MATERIALS AND METHODS 16050-5**

- A. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.
- B. Frames: 16-gage steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling.
  - 1. For installation in masonry, concrete, ceramic tile, or wood paneling: 1 inch-wide-exposed perimeter flange and adjustable metal masonry anchors.
  - 2. For gypsum wallboard or plaster: perforated flanges with wallboard bead.
  - 3. For full-bed plaster applications: galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
- C. Flush Panel Doors: 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.
  - 1. Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism.
- D. Locking Devices: Flush, screwdriver-operated cam locks.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
  - 1. Bar-Co., Inc.
  - 2. J.L. Industries.
  - 3. Karp Associates, Inc.
  - 4. Milcor Div. Inryco, Inc.
  - 5. Nystrom, Inc.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of joint sealers and access panels. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.2 PREPARATION FOR JOINT SEALERS**

- A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.
- B. Apply joint sealer primer to substrates as recommended by joint sealer manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.

### **3.3 SELECTIVE DEMOLITION**

- A. General: Demolish, remove, demount, and disconnect abandoned electrical materials and equipment as required.
- B. Disposal and Cleanup: Remove from the site and legally dispose of demolished materials and equipment as required.
- C. Electrical Materials and Equipment: Demolish, remove, demount, and disconnect the following items:
  - 1. Inactive and obsolete raceway systems, controls, and fixtures.
  - 2. Perform cutting and patching required for demolition.

### **3.4 EXCAVATION**

- A. Slope sides of excavations to comply with local codes and ordinances. Shore and brace as required for stability of excavation.
- B. Shoring and Bracing: Establish requirements for trench shoring and bracing to comply with local codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open.
  - 1. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting at an elevation of 30 inches below finished grade elevation.
- C. Install sediment and erosion control measures in accordance with local codes and ordinances.
- D. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT BASIC ELECTRICAL MATERIALS AND METHODS 16050-7**

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.
  2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
- E. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
1. Locate and retain soil materials away from edge of excavations. Do not store within drip-line of trees indicated to remain.
  2. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.
- F. Excavation for Underground Vaults and Electrical Structures: Conform to local utility company's requirements.
- G. Trenching: Excavate trenches for electrical installations as follows:
1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of raceways and equipment.
  2. Excavate trenches to depth as required by NEC.
  3. Limit the length of open trench to that in which installations can be made and the trench backfilled within the same day.
  4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.
- H. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 deg F (1 deg 2 C).
- I. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below.
1. Under walks and pavements, use a combination of subbase materials and excavated or borrowed materials.
  2. Under building slabs, use drainage fill materials.
  3. Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.



4. For raceways less than 30 inches below surface of roadways, provide 4-inch-thick concrete base slab support. After installation of raceways, provide a 4-inch thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase.
  5. Other areas, use excavated or borrowed materials.
- J. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Inspection, testing, approval, and locations of underground utilities have been recorded.
  2. Removal of concrete formwork.
  3. Removal of shoring and bracing, and backfilling of voids.
  4. Removal of trash and debris.
- K. Placement and Compaction: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- L. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- M. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.
- N. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.
1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).
    - b. Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.

- c. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
  - d. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.
- 2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.
- O. Subsidence: Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

### **3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE**

- A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS "Structural Welding Code."

### **3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGE**

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

### **3.7 APPLICATION OF JOINT SEALERS**

- A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET**

**VOLUNTOWN, CT BASIC ELECTRICAL MATERIALS AND METHODS 16050-10**

1. Comply with recommendations of ASTM C 962 for use of elastomeric joint sealants.
  2. Comply with recommendations of ASTM C 790 for use of acrylic- emulsion joint sealants.
- B. Tooling: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
- C. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

**3.8 INSTALLATION OF ACCESS DOORS**

- A. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.
- B. Adjust hardware and panels after installation for proper operation.

END OF SECTION 16050

## **SECTION 16110 – RACEWAYS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes raceways for electrical wiring. Types of raceways in this section include the following:
  - 1. Electrical metallic tubing (EMT).
  - 2. Flexible metal conduit.
  - 3. Intermediate metal conduit.
  - 4. Liquidtight flexible conduit.
  - 5. Rigid metal conduit.
  - 6. Rigid nonmetallic conduit.
  - 7. Wireway.
  - 8. Surface Raceway

#### **1.2 SUBMITTALS**

- A. General: Submit the following:
- B. Product Data for the following products:
  - 1. Raceway Systems.
- C. Installation Instructions: Manufacturer's written installation instructions for wireway, and raceway products.

#### **1.3 QUALITY ASSURANCE**

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."
- B. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.
- C. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical raceway systems. Provide raceway products and components listed and labeled by UL, ETL, or CSA.

#### **1.4 SEQUENCING AND SCHEDULING**

- A. Coordinate with other Work, including metal and concrete deck installation, as necessary to interface installation of electrical raceways and components with other Work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
- B. Conduit Bodies:
  - 1. Appleton Electric Co.
  - 2. Carlon
  - 3. Killark Electric Mfg. Co.
  - 4. O-Z/Gedney
  - 5. Spring City Electrical Mfg. Co.
- C. Wireway:
  - 1. Erickson Electric Equipment Co.
  - 2. GS Metals Corp.
  - 3. Hoffman Engineering Co.
  - 4. Square D Co.

### 2.2 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Intermediate Steel Conduit: UL 1242.
- C. Electrical Metallic Tubing and Fittings: ANSI C80.3.
- D. Flexible Metal Conduit: UL 1, zinc-coated steel.
- E. Liquidtight Flexible Metal Conduit and Fittings: UL 360. Fittings shall be specifically approved for use with this raceway.

### 2.3 NONMETALLIC CONDUIT AND DUCTS

- A. Rigid Nonmetallic Conduit (RNC): NEMA TC 2 and UL 651, Schedule 40 or 80 PVC.
- B. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.
- C. Conduit, Tubing, and Duct Accessories: Types, sizes, and materials complying with manufacturer's published product information. Mate and match accessories with raceway.

#### **2.4 CONDUIT BODIES**

- A. General: Types, shapes, and sizes as required to suit individual applications and NEC requirements. Provide matching gasketed covers secured with corrosion-resistant screws.
- B. Metallic Conduit and Tubing: Use metallic conduit bodies. Use bodies with threaded hubs for threaded raceways.
- C. Conduit Bodies 1 Inch and Smaller: Use bodies with compression- type EMT connectors.
- D. Nonmetallic Conduit and Tubing: Use nonmetallic conduit bodies conforming to UL 514 B.

#### **2.5 WIREWAYS**

- A. General: Electrical wireways shall be of types, sizes, and number of channels as required to fulfill wiring requirements and comply with applicable provision of NEC.. Fittings and accessories including but not limited to couplings, offsets, elbows, expansion joints, adapters, hold-down straps, and end caps shall match and mate with wireway as required for complete system.
- B. Wireway covers shall be hinged type.

#### **2.6 SURFACE RACEWAYS**

- A. General: One piece low profile paintable steel surface raceway. Durable, scratch resistant paintable finish. Electrical wireways shall be of types, sizes, and number of channels as required to fulfill wiring requirements and comply with applicable provision of NEC. Fittings and accessories including but not limited to couplings, offsets, elbows, expansion joints, adapters, hold down straps, and end caps shall match and mate with wireway as required for complete system.

**PART 3 - EXECUTION**

**3.1 WIRING METHOD**

A. Outdoors: Use the following wiring methods:

1. Exposed / Concealed: Rigid metal conduit, Intermediate metal conduit.
2. Underground: Rigid metal conduit, rigid nonmetallic conduit.
3. Connection to Vibrating Equipment: Including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment: liquid-tight flexible metal conduit. Maximum length six (6) feet.

B. Indoors: Use the following wiring methods:

1. Connection to Vibrating Equipment: Including transformers and hydraulic, pneumatic or electric solenoid or motor-operated equipment: flexible metal conduit. Maximum length six (6) feet.
2. Exposed/Concealed Unfinished Areas: branch circuits - electrical metallic tubing.
3. Exposed/Concealed Unfinished Areas panelboards feeders: intermediate metal conduit, rigid metal conduit.
4. Connection to vibrating equipment and hydraulic, pneumatic, or electric solenoid or motor-driven equipment in moist or humid location or corrosive atmosphere, or where subject to water spray or dripping oil, grease, or water: liquid-tight flexible metal conduit. Maximum length six (6) feet.
5. Finished areas where wiring/conduit cannot be concealed: branch circuits – wiremold V500/V700.

**3.2 INSTALLATION**

- A. General: Install electrical raceways in accordance with manufacturer's written installation instructions, applicable requirements of NEC, and as follows:
- B. Conceal Conduit, within finished walls, ceilings, and floors. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install raceways level and square and at proper elevations.
- C. Elevation of Raceway: Where possible, install horizontal raceway runs above water and steam piping.
- D. Complete installation of electrical raceways before starting installation of conductors within raceways.

- E. Provide supports for raceways as specified elsewhere in Division 16.
- F. Prevent foreign matter from entering raceways by using temporary closure protection.
- G. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- H. Make bends and offsets so the inside diameter is not effectively reduced. Keep the legs of a bend in the same plane and the straight legs of offsets parallel.
- I. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings.
- J. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction.
- K. Install exposed raceways parallel and perpendicular to nearby surfaces or structural members and follow the surface contours as much as practical.
- L. Run exposed, parallel, or banked raceways together. Make bends in parallel or banked runs from the same center line so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run such as from wall to ceiling and that the raceways be of the same size. In other cases provide field bends for parallel raceways.
- M. Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system. Make raceway terminations tight. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.
- N. Tighten set screws of threadless fittings with suitable tool.
- O. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.
- P. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used,



align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.

- Q. Install pull wires in empty raceways. Use no. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.
- R. Telephone and Signal System Raceways 2-Inch Trade Size and Smaller: In addition to the above requirements, install raceways 2-inch and smaller trade size in maximum lengths at 150 feet and with a maximum of two, 90-deg bonds or equivalent. Install pull or junction boxes where necessary to comply with these requirements.
- S. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL- 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 and elsewhere as required:
  - 1. Where conduits enter or leave hazardous locations.
  - 2. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
  - 3. Where required by the NEC.
- T. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6 inches above the floor. Where equipment connections are not made under this contract, install screwdriver-operated threaded flush plugs flush with floor.
- U. Flexible Connections: Use short length (maximum of 6 ft.) of flexible conduit for recessed and semirecessed lighting fixtures, for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet locations. Install separate ground conductor across flexible connections.

### 3.3 ADJUSTING AND CLEANING

- A. Upon completion of installation of raceways, inspect interiors of raceways; clear all blockages and remove burrs, dirt, and construction debris.

END OF SECTION 16110

## **SECTION 16120 – WIRES AND CABLES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes wires, cables, and connectors for power, lighting, signal, control and related systems rated 600 volts and less.

#### **1.2 SUBMITTALS**

- A. Product Data for electrical wires, cables and connectors.

#### **1.3 QUALITY ASSURANCE**

- A. Regulatory Requirements: Comply with provisions of the following code:
- B. NFPA 70 "National Electrical Code."
  - 1. Conform to applicable codes and regulations regarding toxicity of combustion products of insulating materials.
- C. UL Compliance: Provide components which are listed and labeled by UL under the following standards.
  - 1. UL Std. 1569 Metal Clad
  - 2. UL Std. 83 Thermoplastic-Insulated Wires and Cables.
  - 3. UL Std. 486A Wire Connectors and Soldering Lugs for Use with Copper Conductors.
- D. NEMA/ICEA Compliance: Provide components which comply with the following standards:
  - 1. WC-5 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- E. IEEE Compliance: Provide components which comply with the following standard.
  - 1. Std. 82 Test procedures for Impulse Voltage Tests on Insulated Conductors.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
  - 1. Wire and Cable:
    - a. Allied Electrical Group.
    - b. American Insulated Wire Corp.
    - c. Brintec Corp.
    - d. Southwire Company.
  - 2. Connectors for Wires and Cable Conductors:
    - a. AMP
    - b. 3M Company
    - c. O-Z/Gedney Co.
    - d. Square D Company.

**2.2 WIRES AND CABLES**

- A. General: Provide wire and cable suitable for the temperature, conditions and location where installed.
- B. Conductors: Provide solid conductors for power and lighting circuits no. 10 AWG and smaller. Provide stranded conductors for sizes no. 8 AWG and larger.
- C. Conductor Material: Copper for all wires and cables.
- D. Insulation: Provide THHN/THWN-2 insulation for all conductors size 500MCM and larger, and no. 8 AWG and smaller. For all other sizes provide THHN/THWN-2 or XHHW insulation as appropriate for the locations where installed.
- E. Color Coding for phase identification in accordance with Table 1 in Part 3 below.
- F. Jackets: Factory-applied nylon or PVC external jacketed wires and cables for pulls in raceways over 100-feet in length, for pulls in raceways with more than three equivalent 90 deg. bends, for pulls in conduits underground or under slabs on grade, and where indicated.

- G. Cables: Provide the following type(s) of cables in NEC approved locations and applications. Provide cable UL listed for particular application:
1. Metal-Clad Cable: Type MC:
    - a. Limited to above suspended and gypsum wallboard ceilings for lighting fixtures maximum five (5) foot whips.
    - b. Wiring within gypsum wallboard partitions.
    - c. As indicated on drawings.

### 2.3 CONNECTORS FOR CONDUCTORS

- A. Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services as required by code. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF WIRES AND CABLES

- A. General: Install electrical cables, wires, and connectors in compliance with NEC.
- B. Coordinate cable installation with other Work.
- C. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant, where necessary.
- D. Use pulling means including, fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable.
- E. Conceal all cable in finished spaces.
- F. Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours, where possible.
- G. Keep conductor splices to minimum.
- H. Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced.
- I. Use splice and tap connectors which are compatible with conductor material.

- J. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than no 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.
- K. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.

### 3.2 FIELD QUALITY CONTROL

- A. Prior to energizing, check installed wires and cables with megohm meter to determine insulation resistance levels to assure requirements are fulfilled.
- B. Prior to energizing, test wires and cables for electrical continuity and for short-circuits.
- C. Subsequent to wire and cable hook-ups, energize circuits and demonstrate proper functioning. Correct malfunctioning units, and retest to demonstrate compliance.
- D. TABLE 1: Color Coding for Phase Identification:
  - 1. Color code secondary service, feeder, and branch circuit conductors with factory applied color as follows:

| <u>240/120 Volts</u> | <u>Phase</u> | <u>208/120 Volts</u> |
|----------------------|--------------|----------------------|
| Black                | A            | Black                |
| Red                  | B            | Red                  |
| -                    | C            | Blue                 |
| White                | Neutral      | White                |
| Green                | Ground       | Green                |

END OF SECTION 16120

**SECTION 16135 – CABINETS, BOXES AND FITTINGS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This section includes cabinets, boxes, and fittings for electrical installations and certain types of electrical fittings not covered in other sections. Types of products specified in this Section include:
  - 1. Outlet and device boxes.
  - 2. Pull and junction boxes.
  - 3. Cabinets.
  - 4. Hinged door enclosures.

**1.2 DEFINITIONS**

- A. Cabinets: An enclosure designed either for surface or for flush mounting and having a frame, or trim in which a door or doors may be mounted.
- B. Device Box: An outlet box designed to house a receptacle device or a wiring box designed to house a switch.
- C. Enclosure: A box, case, cabinet, or housing for electrical wiring or components.
- D. Outlet Box: A wiring enclosure where current is taken from a wiring system to supply utilization equipment.
- E. Wiring Box: An enclosure designed to provide access to wiring systems or for the mounting of indicating devices or of switches for controlling electrical circuits.

**1.3 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:
  - 1. Product data for cabinets and enclosures with classification higher than NEMA 1.
  - 2. Shop drawings for boxes, enclosures and cabinets that are to be shop fabricated, (nonstock items). For shop fabricated junction and pull boxes, show accurately scaled views and spatial relationships to adjacent equipment. Show box types, dimensions, and finishes.

#### 1.4 QUALITY ASSURANCE

- A. UL Listing and Labeling: Items provided under this section shall be listed and labeled by UL.
- B. Nationally Recognized Testing Laboratory Listing and Labeling (NRTL): Items provided under this section shall be listed and labeled by a NRTL. The term "NRTL" shall be as defined in OSHA Regulation 1910.7.
- C. National Electrical Code Compliance: Components and installation shall comply with NFPA 70 "National Electrical Code."
- D. NEMA Compliance: Comply with NEMA Standard 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)."

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Outlet Boxes:
    - a. American Electric.
    - b. Cooper Industries, Inc.
    - c. Racor, Inc.
    - d. Thomas & Betts Corp.
  - 2. Cabinets:
    - a. Electric Panelboard, Inc.
    - b. Erickson Electrical Equipment Co.
    - c. Hoffman Engineering Co.
    - d. Spring City Electrical Mfg. Co.
    - e. Square D Co.

#### 2.2 CABINETS, BOXES, AND FITTINGS, GENERAL

- A. Electrical Cabinets, Boxes, and Fittings: Provide units of types, sizes, and classes appropriate for the use and location. Provide all items complete with covers and

accessories required for the intended use. Provide gaskets for units in damp or wet locations.

### **2.3 MATERIALS AND FINISHES**

- A. Sheet Steel: Flat-rolled, code-gage, galvanized steel.
- B. Fasteners for General Use: Corrosion resistant screws and hardware including cadmium and zinc plated items.
- C. Fasteners for Damp or Wet Locations: Stainless steel screws and hardware.
- D. Cast Metal for Boxes, Enclosures, and Covers; Copper-free aluminum.
- E. Exterior Finish: Gray baked enamel for items exposed in finished locations.
- F. Fittings for Boxes, Cabinets, and Enclosures: Conform to UL 514B. Malleable iron or zinc plated steel for conduit hubs, bushings and box connectors.

### **2.4 METAL OUTLET, DEVICE, AND SMALL WIRING BOXES**

- A. General: Conform to UL 514A, "Metallic Outlet Boxes, Electrical," and UL 514B, "Fittings for Conduit and Outlet Boxes." Boxes shall be of type, shape, size, and depth to suit each location and application.
- B. Steel Boxes: Conform to NEMA OS 1, "Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports." Boxes shall be sheet steel with stamped knockouts, threaded screw holes and accessories suitable for each location including mounting brackets and straps, cable clamps, exterior rings and fixture studs.
- C. Cast-Iron Boxes: Iron alloy, waterproof, with threaded raceway entries and features and accessories suitable for each location, including mounting ears, threaded screw holes for devices and closure plugs.

### **2.5 PULL AND JUNCTION BOXES**

- A. General: Comply with UL 50, "Electrical Cabinets and Boxes", for boxes over 100 cubic inches volume. Boxes shall have screwed or bolted on covers of material same as box and shall be of size and shape to suit application.



- B. Steel Boxes: Sheet steel with welded seams. Where necessary to provide a rigid assembly, construct with internal structural steel bracing.
- C. Hot-Dipped Galvanized Steel Boxes: Sheet steel with welded seams. Where necessary to provide a rigid assembly, construct with internal structural steel bracing. Hot-dip galvanized after fabrication. Cover shall be gasketed.
- D. Stainless-Steel Boxes: Fabricate of stainless steel conforming to Type 302 of ASTM A 167, "Specification for Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip." Where necessary to provide a rigid assembly, construct with internal structural stainless steel bracing. Cover shall be gasketed.
- E. Cast-Iron Boxes: Molded of cast iron alloy with gasketed cover and integral threaded conduit entrances.

## 2.6 CABINETS

- A. Comply with UL 50, "Electrical Cabinets and Boxes."
- B. Construction: Sheet steel, NEMA 1 class except as otherwise required. Cabinet shall consist of a box and a front consisting of a one piece frame and a hinged door. Arrange door to close against a rabbet placed all around the inside edge of the frame, with a uniformly close fit between door and frame. Provide concealed fasteners, not over 24-inches apart, to hold fronts to cabinet boxes and provide for adjustment. Provide flush or concealed door hinges not over 24-inches apart and not over 6-inches from top and bottom of door. For flush cabinets, make the front approximately 3/4 inch larger than the box all around. For surface mounted cabinets make front same height and width as box.
- C. Doors: Double doors for cabinets wider than 24-inches.
- D. Locks: Combination spring catch and key lock, with all locks for cabinets of the same system keyed alike. Locks may be omitted on signal, power, and lighting cabinets located within wire closets and mechanical-electrical rooms. Locks shall be of a type to permit doors to latch closed without locking.

## 2.7 STEEL ENCLOSURES WITH HINGED DOORS

- A. Comply with UL 50, "Cabinets and Enclosures" and NEMA ICS 6,
- B. "Enclosures for Industrial Controls and Systems."

- C. Construction: Sheet steel, 16 gage, minimum, with continuous welded seams. NEMA class as required; arranged for surface mounting.
- D. Doors: Hinged directly to cabinet and removable, with approximately 3/4-inch flange around all edges, shaped to cover edge of box. Provide handle operated, key locking latch. Individual door width shall be no greater than 24-inches. Provide multiple doors where required.
- E. Mounting Panel: Provide painted removable internal mounting panel for component installation.
- F. Enclosure: NEMA 12. Where door gasketing is required, provide neoprene gasket attached with oil-resistant adhesive, and held in place with steel retaining strips. For all enclosures of class higher than NEMA 1, use hubbed raceway entrances.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION, GENERAL**

- A. Locations: Install items where required to suit code requirements and installation conditions.
- B. Cap unused knockout holes where blanks have been removed and plug unused conduit hubs.
- C. Support and fasten items securely in accordance with Division 16 Section "Supporting Devices."
- D. Sizes shall be adequate to meet NEC volume requirements.
- E. Remove sharp edges where they may come in contact with wiring or personnel.

#### **3.2 APPLICATIONS**

- A. Cabinets: Flush mounted, NEMA enclosure type suitable for installation location.
- B. Hinged Door Enclosures: NEMA Type 12 enclosure.
- C. Hinged Door Enclosures Outdoors: Install drip hood, factory tailored to individual units.

- D. Outlet Boxes and Fittings: Install outlet and device boxes and associated covers and fittings of materials and NEMA types suitable for each location and in conformance with the following requirements:
  - 1. Interior Dry Locations: NEMA Type 1, sheet steel or as permitted by local code.
  - 2. Locations Exposed to Weather, Dampness, or Wet Locations: NEMA Type 3R or 4 enclosures.
  - 3. Exterior locations: NEMA Type 3R.
- E. Pull and Junction Boxes: Install pull and junction boxes of materials and NEMA types suitable for each location, unless otherwise noted.
  - 1. Exterior locations provide NEMA Type 4X.

### 3.3 INSTALLATION OF OUTLET BOXES

- A. Outlets at Windows and Doors: Locate close to window trim.
- B. Column and Pilaster Locations: Locate outlet boxes for switches and receptacles on columns or pilasters so the centers of the columns are clear for future installation of partitions.
- C. Locations in Special Finish Materials: For outlet boxes for receptacles and switches mounted in desks or furniture cabinets or in glazed tile, concrete block, marble, brick, stone or wood walls, use rectangular shaped boxes with square corners and straight sides. Install such boxes without plaster rings. Saw cut all recesses for outlet boxes in exposed masonry walls.
- D. Gasketed Boxes: At the following locations use cast metal, threaded hub type boxes with gasketed weatherproof covers:
  - 1. Exterior locations.
  - 2. Where surface mounted on unfinished walls, columns or pilasters. (Cover gaskets may be omitted in dry locations).
  - 3. Where exposed to moisture laden atmosphere.
- E. Cast-Iron Boxes: Iron alloy, waterproof, with threaded raceway entries and features and accessories suitable for each location, including mounting ears, threaded screw holes for devices and closure plugs.
- F. Mounting: Mount outlet boxes for switches with the long axis vertical or as indicated. Mount boxes for receptacles either vertically or horizontally but consistently either

way. Three or more gang boxes shall be mounted with the long axis horizontal. Locate box covers or device plates so they will not span different types of building finishes either vertically or horizontally. Locate boxes for switches near doors on the side opposite the hinges and close to door trim, even though electrical floor plans may show them on hinge side.

- G. Ceiling Outlets: For fixtures, where wiring is concealed, use outlet boxes 4-inches square by 1-1/2-inches deep, minimum.
- H. Cover Plates for Surface Boxes: Use plates sized to box front without overlap.
- I. Protect outlet boxes to prevent entrance of plaster, and debris. Thoroughly clean foreign material from boxes before conductors are installed.

### 3.4 INSTALLATION OF PULL AND JUNCTION BOXES

- A. Box Selection: For boxes in main feeder conduit runs, use sizes not smaller than 8-inches square by 4-inches deep. Do not exceed 6 entering and 6 leaving raceways in a single box. Quantities of conductors (including equipment grounding conductors) in pull or junction box shall not exceed the following:

| Size of<br>Largest<br>Conductors<br>in Box | Maximum<br>no. of<br>Conductors<br>in Box |
|--|---|
| No. 4/0 AWG                                | 30  |
| 250 MCM                                    | 20  |
| 500 MCM                                    | 15  |
| Over 500 MCM                               | 10  |

- 1. Cable Supports: Install clamps, grids, or devices to which cables may be secured. Arrange cables so they may be readily identified. Support cable at least every 30-inches inside boxes.
- 2. Mount pull boxes in inaccessible ceilings with the covers flush with the finished ceiling.
- 3. Size: Provide pull and junction boxes for telephone, signal, and other systems at least 50 percent larger than would be required by Article 314 of NEC. Locate boxes strategically and provide shapes to permit easy pulling of future wires or cables of types normal for such systems.

**3.5 INSTALLATION OF CABINETS AND HINGED DOOR ENCLOSURES**

- A. Mount with fronts straight and plumb.
- B. Install with tops 78-inches above floor.
- C. Set cabinets in finished spaces flush with walls.

**3.6 GROUNDING**

- A. Electrically ground metallic cabinets, boxes, and enclosures. Where wiring to item includes a grounding conductor, provide a grounding terminal in the interior of the cabinet, box or enclosure.

**3.7 CLEANING AND FINISH REPAIR**

- A. Upon completion of installation, inspect components. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, abrasions and weld marks.
- B. Galvanized Finish: Repair damage using a zinc-rich paint recommended by the tray manufacturer.
- C. Painted Finish: Repair damage using matching corrosion inhibiting touch-up coating.

END OF SECTION 16135

**SECTION 16143 – WIRING DEVICES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Receptacles
  - 2. Ground Fault Circuit Interrupter Receptacles
  - 3. Snap Switches
  - 4. Wall Plates

**1.2 SUBMITTALS**

- A. Product data for each type of product specified.
- B. Samples of those products indicated for sample submission in Engineer's comments on product data submittal. Include color and finish samples of device plates and other items per Engineer's request.

**1.3 QUALITY ASSURANCE**

- A. Regulatory Requirements: Comply with provisions of the following codes.
- B. NFPA 70 "National Electrical Code".
  - 1. UL and NEMA Compliance: Provide wiring devices which are listed and labeled by UL and comply with applicable UL and NEMA standards.

**1.4 SEQUENCE AND SCHEDULING**

- A. Schedule installation of finish plates after the surface upon which they are installed has received final finish.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but not limited to, the following:
  - 1. General Electric Co.

2. Hubbell Inc.
3. Leviton
4. Pass and Seymour Inc.

## 2.2 WIRING DEVICES:

- A. General: Provide wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards. Coordinate color of devices and wall plates with Owner/Owner's Representative.
- B. Receptacles: As scheduled in Table 1 in Part 3 below. Comply with UL 498 and NEMA WD 1.
- C. Ground-Fault Interrupter (GFI) Receptacles: as indicated in Table 1 in Part 3 below; provide "feed-thru" type ground-fault circuit interrupter, with integral heavy-duty NEMA 5-20R duplex receptacles arranged to protect connected downstream receptacles on same circuit. Provide unit designed for installation in a 2-3/4 inch deep outlet box without adapter, grounding type, Class A, Group 1, per UL Standard 94.3.
- D. Snap Switches: quiet type AC switches as indicated in Table 2 in Part 3 below. Comply with UL 20 and NEMA WD1.

## 2.3 WIRING DEVICE ACCESSORIES

- A. Wall plates: single and combination, of types, sizes, and with ganging and cutouts as required. Provide plates which mate and match with wiring devices to which attached. Provide metal screws for securing plates to devices with screw heads colored to match finish of plates. Provide wall plates with engraved legend where required. Provide plates possessing the following additional construction features:
  1. Material and Finish: 0.04 inch thick, type 302 satin finished.
  2. Material and Finish: steel plate, galvanized, limited to mechanical rooms only.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF WIRING DEVICES AND ACCESSORIES

- A. Install wiring devices and accessories, in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other Work, including painting, electrical boxes and wiring installations, as necessary to interface installation of wiring devices with other Work.

- C. Install wiring devices only in electrical boxes which are clean; free from building materials, dirt, and debris.
- D. Install wiring devices after wiring work is completed.
- E. Install wall plates after painting work is completed.
- F. Install telephone/power service connections in accordance with final equipment/furnishings arrangement plan, plumb, true, and secure.
- G. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A. Use properly scaled torque indicating hand tool.

### **3.2 PROTECTION**

- A. Protect installed components from damage. Replace damaged items prior to final acceptance.

### **3.3 FIELD QUALITY CONTROL**

- A. Testing: Prior to energizing circuits, test wiring for electrical continuity, and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energizing, test wiring devices and demonstrate compliance with requirements, operating each operable device at least six times.
- B. Test ground fault interrupter operation with both local and remote fault simulations in accordance with manufacturer recommendations.



C. TABLE 1

RECEPTACLES

| DESIG-<br>NATION<br>(1) | CURRENT<br>RATING<br>AMPS<br>NOTES | VOLTAGE<br>RATING | NEMA<br>SINGLE/<br>DUPLEX | CONFIG-<br>URATION | UL GRADE                 |
|-------------------------|------------------------------------|-------------------|---------------------------|--------------------|--------------------------|
| -                       | 20                                 | 125               | DUPLEX                    | 5-20R              | HEAVY DUTY               |
| -                       | 20                                 | 125               | SINGLE                    | 5-20R              | HEAVY DUTY               |
| GFCI                    | 20                                 | 125               | DUPLEX                    | 5-20R              | HEAVY DUTY INTEGRAL GFCI |
| WP<br>GFCI              | 20                                 | 125               | DUPLEX                    | 5-20R              | HEAVY DUTY INTEGRAL GFCI |

NOTES

(1) Letter designations are used where symbols alone do not clearly designate on plans locations where specific receptacle types are used.

D. TABLE 2

SNAP SWITCHES

| DESIG-<br>NATION<br>(1) | TYPICAL<br>APPLICATION | LOAD<br>RATING | VOLTAGE<br>RATING<br>(AC) | POLES | UL GRADE   | NOTES |
|-------------------------|------------------------|----------------|---------------------------|-------|------------|-------|
| S                       | CONTROL<br>LIGHTS      | 20A            | 120/277                   | 1     | HEAVY DUTY | -     |
| S3                      | CONTROL                | 20A            | 120/277                   | 3-way | HEAVY DUTY |       |
| -                       | LIGHTS                 |                |                           |       |            |       |
| S                       | DISCONN.<br>MOTOR      | 1HP            | 120/277                   | 1     | HEAVY DUTY | (2)   |
| STOL                    | DISCONN.<br>MOTOR      | 2HP            | 208/480                   | 3     | HEAVY DUTY | (2)   |

**NOTES**

- (1) For snap switches, designation is the same as the symbol used on plans for the device. Type of switch is determined from plan context including type of device or circuit being controlled.
- (2) With overload element in switch.

**END OF SECTION 16143**

**SECTION 16170 - CIRCUIT AND MOTOR DISCONNECTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes circuit and motor disconnects.

**1.2 SUBMITTALS**

- A. Product data for each type of product specified.
- B. Maintenance data for circuit and motor disconnects, for inclusion in Operation and Maintenance Manual specified in Division 1 and Division 16 Section "Basic Electrical Requirements."

**1.3 QUALITY ASSURANCE**

- A. Electrical Component Standards: Provide components complying with NFPA 70 "National Electrical Code" and which are listed and labeled by UL. Comply with UL Standard 98 and NEMA Standard KS 1.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
  - 1. Appleton
  - 2. Crouse-Hinds Co.
  - 3. Eaton Corp.
  - 4. General Electric Co.
  - 5. Square D Company.

**2.2 CIRCUIT AND MOTOR DISCONNECT SWITCHES**

- A. General: Provide circuit and motor disconnect switches in types, sizes, duties, features ratings, and enclosures required by NEC for load served and as indicated on drawings. Provide NEMA 1 enclosure in interior locations and NEMA 3R enclosure for exterior locations. For motor and motor starter disconnects, provide units with horsepower ratings suitable to the loads.

- B. Fusible Switches: Heavy duty switches, with fuses of classes and current ratings required by NEC for load served. Where current limiting fuses are required, provide switches with non-interchangeable feature suitable only for current limiting type fuses.
- C. Non-fusible Disconnects: Heavy duty switches of classes and current ratings as required by NEC for load served.
- D. Double-Throw Switches: Heavy duty switches of classes and current ratings as required by NEC for load served

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECTS**

- A. General: Provide circuit and motor disconnect switches where required by code. Comply with switch manufacturers' printed installation instructions.

#### **3.2 FIELD QUALITY CONTROL**

- A. Testing: Subsequent to completion of installation of electrical disconnect switches, energize circuits and demonstrate capability and compliance with requirements. Do not test switches by operating them under load. However, demonstrate switch operation through six opening/closing cycles with circuit unloaded. Open each switch enclosure for inspection of interior, mechanical and electrical connections, fuse installation, and for verification of type and rating of fuses installed. Correct deficiencies then retest to demonstrate compliance. Remove and replace defective units with new units and retest.

END OF SECTION 16170

**SECTION 16190 - SUPPORTING DEVICES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.

**1.2 SUBMITTALS**

- A. Product data for each type of product specified.
  - 1. Hanger and support schedule showing manufacturer's figure number, size, spacing, features, and application for each required type of hanger, support, sleeve, seal, and fastener to be used.
- B. Shop drawings indicating details of fabricated products and materials.

**1.3 QUALITY ASSURANCE**

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."
- B. Electrical components shall be listed and labeled by UL, ETL, CSA, or other approved, nationally recognized testing and listing agency that provides third-party certification follow-up services.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Slotted Metal Angle and U-Channel Systems:
    - a. Allied Tube & Conduit
    - b. American Electric
    - c. B-Line Systems, Inc.
    - d. Cinch Clamp Co., Inc.

- e. GS Metals Corp.
  - f. Kin-Line, Inc.
  - g. Unistrut Diversified Products
2. Conduit Sealing Bushings:
- a. Cooper Industries, Inc.
  - b. GS Metals Corp.
  - c. Killark Electric Mfg. Co.
  - d. O-Z/Gedney
  - e. Racco, Inc.
  - f. Spring City Electrical Mfg. Co.
  - g. Thomas & Betts Corp.

## 2.2 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.

## 2.3 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners: Types, materials, and construction features as follows:
- 1. Expansion Anchors: Carbon steel wedge or sleeve type.
  - 2. Toggle Bolts: All steel springhead type.
  - 3. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.
- C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.

- E. U-Channel Systems: 16-gage steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacture.

## **2.4 FABRICATED SUPPORTING DEVICES**

- A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
  - 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
    - a. 3-inch and smaller: 20-gage.
    - b. 4-inch to 6-inch: 16-gage.
    - c. over 6-inch: 14-gage.
  - 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
  - 3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installation.
- C. Raceway Supports: Comply with the NEC and the following requirements:
  - 1. Conform to manufacturer's recommendations for selection and installation of supports.
  - 2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.

3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
  4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
  5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
  6. Space supports for raceways in accordance with Table I of this section. Space supports for raceway types not covered by the above in accordance with NEC.
  7. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
  8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- D. Vertical Conductor Supports: Install simultaneously with installation of conductors.
- E. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- F. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- G. Sleeves: Install in concrete slabs and walls and all other fire-rated floors and walls for raceways and cable installations. For sleeves through fire-rated-wall or floor construction, apply UL-listed firestopping sealant in gaps between sleeves and enclosed conduits and cables in accordance with "Fire Resistant Joint Sealers" requirement of Division 7 Section "Joint Sealers."
- H. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.



- I. Fastening: Fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:
  - 1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
  - 2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
  - 3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.
- J. TESTS: Test pull-out resistance of one of each type, size, and anchorage material for the following fastener types:
  - 1. Expansion anchors.
  - 2. Toggle bolts.
  - 3. Powder-driven threaded studs.
- K. Provide all jacks, jigs, fixtures, and calibrated indicating scales required for reliable testing. Obtain a structural Engineer's approval before transmitting loads to the structure. Test to 90 percent of rated proof load for fastener. If fastening fails test, revise all similar fastener installations and retest until satisfactory results are achieved.

3.2 TABLE I: SPACING FOR RACEWAY SUPPORTS

HORIZONTAL RUNS

| <u>Raceway Size<br/>(Inches)</u> | <u>No. of<br/>Conductors<br/>in Run</u> | <u>Location</u>   | <u>RMC &amp;<br/>IMC<br/>(1)</u> | <u>EMT<br/>(1)</u> |
|----------------------------------|---|---|----------------------------------|--------------------|
| 1/2,3/4                          | 1 or 2                                  | Flat ceiling or wall.   | 5                                | 5                  |
| 1/2,3/4                          | 1 or 2                                  | Where it is difficult to provide supports except at intervals fixed by the building construction. | 7                                | 7                  |
| 1/2,3/4                          | 3 or more                               | Any location.   | 7                                | 7                  |
| 1/2-1                            | 3 or more                               | Any location.   | 7                                | 7                  |
| 1 & larger                       | 1 or 2                                  | Flat ceiling or wall.   | 6                                | 6                  |
| 1 & larger                       | 1 or 2                                  | Where it is difficult to provide supports except at intervals fixed by the building construction  | 10                               | 10                 |
| 1 & larger                       | 3 or more                               | Any location.   | 10                               | 10                 |
| Any                              | ....                                    | Concealed.  | 10                               | 10                 |

VERTICAL RUNS

| <u>Raceway Size<br/>(Inches)</u> | <u>No. of<br/>Conductors<br/>in Run</u> | <u>Location</u> | <u>RMC &amp;<br/>IMC<br/>(1,2)</u> | <u>EMT<br/>(1)</u> |
|----------------------------------|---|-----------------|------------------------------------|--------------------|
| 1/2,3/4                          | ....                                    | Exposed.        | 7                                  | 7                  |
| 1,1-1/4                          | ....                                    | Exposed.        | 8                                  | 8                  |
| 1-1/2 and larger                 | ....                                    | Exposed.        | 10                                 | 10                 |
| Up to 2                          | ....                                    | Shaftway.       | 14                                 | 10                 |
| 2-1/2                            | ....                                    | Shaftway.       | 16                                 | 10                 |
| 3 & larger                       | ....                                    | Shaftway.       | 20                                 | 10                 |
| Any                              | ....                                    | Concealed.      | 10                                 | 10                 |

NOTES:

- (1) Maximum spacing of supports (feet).  
 (2) Maximum spacing for IMC above apply to straight runs only. Otherwise the maximums for EMT apply.

**TOWN OF VOLUNTOWN  
PUBLIC WORKS GARAGE  
96 GATE STREET  
VOLUNTOWN, CT**

**SUPPORTING DEVICES**

**16190-7**

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Abbreviations:        EMT Electrical metallic tubing.  
                              IMC Intermediate metallic conduit.  
                              RMC Rigid metallic conduit.

END OF SECTION 16190

## **SECTION 16195 - ELECTRICAL IDENTIFICATION**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to the following:
  - 1. Buried electrical line warnings.
  - 2. Identification labeling for raceways, cables, and conductors.
  - 3. Operational instruction signs.
  - 4. Warning and caution signs.
  - 5. Equipment labels and signs.
- B. Refer to other Division 16 sections for additional specific electrical identification associated with specific items.

#### **1.2 SUBMITTALS**

- A. Product Data for each type of product specified.
- B. Schedule of identification nomenclature to be used for identification signs and labels.
- C. Samples of each color, lettering style, and other graphic representation required for identification materials; samples of labels and signs.

#### **1.3 QUALITY ASSURANCE**

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."
- B. ANSI Compliance: Comply with requirements of ANSI Standard A13.1, "Scheme for the Identification of Piping Systems," with regard to type and size of lettering for raceway and cable labels.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. American Labelmark Co.
  2. Ideal Industries, Inc.
  3. LEM Products, Inc.
  4. National Band and Tag Co.
  5. Panduit Corp.
  6. Seton Name Plate Co.

## 2.2 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Adhesive Marking Labels for Raceway and Metal-clad Cable: Pre- printed, flexible, self-adhesive labels with legend indicating voltage and service (Emergency, Lighting, Power, Light, Power d.c., Air Conditioning, Communications, Control, Fire).
- B. Label Size: as follows:
1. Raceways 1-Inch and Smaller: 1-1/8 inches high by 4 inches long.
  2. Raceways Larger than 1-Inch: 1-1/8 inches high by 8 inches long.
- C. Color: Black legend on orange background.
- D. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.
- E. Pretensioned Flexible Wraparound Colored Plastic Sleeves for Raceway and Cable Identification: Flexible acrylic bands sized to suit the raceway diameter and arranged to stay in place by pre- tensioned gripping action when coiled around the raceway or cable.
- F. Underground Line Marking Tape: Permanent, bright-colored, continuous-printed, plastic tape compounded for direct-burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.
- G. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self- adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.
- H. Aluminum, Wraparound, Cable Marker Bands: Bands cut from 0.014- inch thick, aluminum sheet, fitted with slots or ears for securing permanently around wire or cable jacket or around groups of conductors. Provide for legend application with stamped letters or numbers.

- I. Plasticized Card Stock Tags: Vinyl cloth with preprinted and field-printed legends to suit the application. Orange background, except as otherwise indicated, with Eyelet for fastener.
- J. Aluminum-Faced Card Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inches thick, and laminated with moisture-resistant acrylic adhesive. Pre-print legend to suit the application, and punch for tie fastener.
- K. Brass or Aluminum Tags: Metal tags with stamped legend, punched for fastener. Dimensions: 2 inches by 2 inches by 19 gage.
- L. Engraved, Plastic-Laminated Labels, Signs, and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8-inch thick for larger sizes. Engraved legend in white letters on black face and punched for mechanical fasteners.
- M. Baked-Enamel Warning and Caution Signs for Interior Use: Preprinted aluminum signs, punched for fasteners, with colors, legend, and size appropriate to the location.
- N. Exterior Metal-Backed Butyrate Warning and Caution Signs: Weather-resistant, nonfading, preprinted cellulose acetate butyrate signs with 20-gage, galvanized steel backing, with colors, legend, and size appropriate to the location. Provide 1/4-inch grommets in corners for mounting.
- O. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.
- P. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self- locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 50 deg F to 350 deg F. Provide ties in specified colors when used for color coding.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.

- B. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.
- C. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
- D. Conduit Identification:
- E. Identify high-voltage feeder conduits (over 600 V) by words "DANGER-HIGH VOLTAGE" in black letters 2 inches high, stenciled at 10-foot intervals over continuous painted orange background.
  - 1. The following areas shall be identified:
    - a. On entire floor area directly above conduits running beneath and within 12 inches of a basement or ground floor that is in contact with earth or is framed above unexcavated space.
    - b. On wall surfaces directly external to conduits run concealed within wall.
    - c. On all accessible surfaces of concrete envelope around conduits in vertical shafts, exposed at ceilings or concealed above suspended ceilings.
    - d. On entire surface of exposed conduits.
  - 2. Apply identification to areas as follows:
    - a. Clean surface of dust, loose material, and oily films before painting.
    - b. Prime surfaces: For galvanized metal, use single-component acrylic vehicle coating formulated for galvanized surfaces. For concrete masonry units, use heavy-duty acrylic resin block filler. For concrete surfaces, use clear alkali- resistant alkyd binder-type sealer.
    - c. Apply one intermediate and one finish coat of orange silicone alkyd enamel.
    - d. Apply primer and finish materials in accordance with manufacturer's instructions.
- F. Identify Raceways of Certain Systems with Color Banding: Band exposed or accessible raceways of the following systems for identification. Bands shall be pretensioned, snap-around colored plastic sleeves, colored adhesive marking tape, or a combination of the two. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side. Install bands at changes in direction, at penetrations of walls and floors, and at 40-foot maximum intervals in straight runs. Apply the following colors:

1. Fire Alarm System: Red
  2. Fire Suppression Supervisory and Control System: Red and Yellow
  3. Security System: Blue and Yellow
  4. Mechanical and Electrical Supervisory System: Green and Blue
  5. Telephone System: Green and Yellow
- G. Identify Junction, Pull, and Connection Boxes: Code-required caution sign for boxes shall be pressure-sensitive, self-adhesive label indicating system voltage in black, preprinted on orange background. Install on outside of box cover. Also label box covers with identity of contained circuits. Use pressure-sensitive plastic labels at exposed locations and similar labels or plasticized card stock tags at concealed boxes.
- H. Underground Electrical Line Identification: During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground plastic line marker, located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.
- I. Limit use of line markers to direct-burial cables.
- J. Install line marker for underground wiring, both direct-buried and in raceway.
- K. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as follows:

| <u>240/120 Volts</u> | <u>Phase</u> | <u>208/120 Volts</u> |
|----------------------|--------------|----------------------|
| Black                | A            | Black                |
| Red                  | B            | Red                  |
| -                    | C            | Blue                 |
| White                | Neutral      | White                |
| Green                | Ground       | Green                |

- L. Use conductors with color factory-applied the entire length of the conductors except as follows:
1. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
    - a. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent



possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.

- b. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.
- M. Power Circuit Identification: Securely fasten identifying metal tags or aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms with 1/4-inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-lb test monofilament line or one-piece self-locking nylon cable ties.
- N. Tag or label conductors as follows:
1. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicating source and circuit numbers.
  2. Multiple Circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by mean of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.
  3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.
- O. Apply warning, caution, and instruction signs and stencils as follows:
1. Install warning, caution, or instruction signs where required by NEC, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.

2. Emergency Operating Signs: Install engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.
- P. Install equipment/system circuit/device identification as follows:
1. Apply equipment identification labels of engraved plastic- laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Provide single line of text, with 1/2-inch-high lettering on 1-1/2-inch-high label (2-inch-high where two lines are required), white lettering in black field. Text shall match terminology and numbering of the Contract Documents and shop drawings. Apply labels for each unit of the following categories of electrical equipment.
    - a. Panelboards, electrical cabinets, and enclosures.
    - b. Access doors and panels for concealed electrical items.
    - c. Electrical switchgear and switchboards.
    - d. Motor starters.
    - e. Contactors.
    - f. Control devices.
    - g. Telephone equipment.
    - h. Fire alarm control panel.
    - i. Time clocks
- Q. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.
- R. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

END OF SECTION 16195

**SECTION 16420 - SERVICE ENTRANCE**

**PART 1 - GENERAL**

**1.1 SUMMARY:**

- A. Types of service-entrance equipment in this section include the following:
  - 1. Circuit-breakers.
  - 2. Fuses.
  - 3. Meter sockets.
  - 4. Switches.

**1.2 SUBMITTALS:**

- A. Product Data: Submit manufacturer's data on service-entrance equipment and accessories.
- B. Shop Drawings: Submit dimensioned layouts of service-entrance equipment, including spatial relationships to proximate electrical equipment.
- C. Wiring Diagrams: Submit power, signal and control wiring diagrams for service-entrance work. Differentiate between portions of wiring/cabling that are manufacturer-installed and portions that are field-installed.

**1.3 QUALITY ASSURANCE:**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of service-entrance equipment, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 5 years of successful installation experience with projects utilizing service-entrance work similar to that required for this project.
- C. Codes and Standards:
  - 1. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC, including Articles 230, 250, and 338, as applicable to installation, and construction of service-entrances.
  - 2. NEMA Compliance: Comply with applicable construction and installation requirements of the following NEMA standards for service-entrance equipment and accessories:

- a. Stds Pub/No. KS 1: Enclosed Switches.
  - b. Stds Pub/No. PB 2: Deadfront Distribution Switchboards.
  - c. Stds Pub/No. PB 2.2: Application Guide for Ground-fault Protective Devices for Equipment.
3. UL Compliance: Comply with construction and installation requirements of the following UL standards for service-entrance equipment and accessories:
  - a. UL 50: Electrical Cabinets and Boxes.
  - b. UL 489: Molded-Case Circuit Breakers and Circuit-Breaker Enclosures.
  - c. UL 854: Service-Entrance Cables.
  - d. UL 869: Electrical Service Equipment.
4. Provide service-entrance equipment and accessories which are UL-listed and labeled, and marked, "SUITABLE FOR USE AS SERVICE EQUIPMENT."
5. IEEE Compliance: Comply with applicable requirements of IEEE Std 241 pertaining to service entrances.

#### 1.4 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver service-entrance equipment components properly packaged and mounted on pallets, or skids to facilitate handling of heavy items. Utilize factory-fabricated type containers or wrappings for service-entrance equipment and components which protect equipment from damage. Install gravity measuring meters in containers which indicate whether container has been bumped or dropped. Return G-meters to manufacturer for reuse upon delivery of switchgear. Inspect equipment to ensure that no damage has occurred during shipment.
- B. Store service-entrance equipment in original packaging and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.
- C. Handle service-entrance equipment carefully to prevent physical damage to equipment and components. Remove packaging, including the opening of crates and containers, avoiding the use of excessive hammering and jarring which would damage the electrical equipment contained therein. Do not install damaged equipment; remove from site and replace damaged equipment with new.

#### 1.5 SEQUENCING AND SCHEDULING:

- A. Schedule delivery of service-entrance equipment which permits ready building ingress for large equipment components to their designated installation spaces. Coordinate delivery of equipment with the installation of other building components.

- B. Coordinate the size and location of concrete equipment pads. Cast anchor bolt inserts into pad. Concrete, reinforcement, and formwork requirements as per code.
- C. Coordinate with other electrical work including raceways, electrical boxes and fittings, and cabling/wiring work, as necessary to interface installation of service-entrance work with other work.

**1.6 MAINTENANCE:**

- A. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 10 installed units, but not less than 5 units of each.

**PART 2 - PRODUCTS**

**2.1 SERVICE-ENTRANCE EQUIPMENT:**

- A. General: Provide service-entrance equipment and accessories; of types, sizes, ratings and electrical characteristics required for electrical load in accordance with NEC, which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified.
- B. Switches and Fuse Units: Provide interrupter switches and fuse units; consisting of 3-pole, single-throw switch with 3 power fuses; front-mounted operating handle with mechanical interlock between switch and access door to fuses; with cable entry and set of terminal blocks, small wiring and ground bus.
  - 1. Fuses: Provide fuses in accordance with the following listed electrical characteristics:
    - a. Class L time-delay.
- C. Service Entrance (SE) Cabinet: Provide cold sequence service entrance cabinet with current transformer compartment and main service disconnect compartment. Main service disconnect type (circuit breaker or fused switch) shall be as indicated on Drawings.
  - 1. SE Cabinet shall be suitable for use as Service Entrance Equipment, UL Listed and acceptable to local utility company.
  - 2. Enclosure shall be NEMA 1 rated, front accessible, totally enclosed with gray baked enamel finish.

D. Meter Sockets:

1. General: Provide meter sockets which comply with requirements of local utility company supplying electrical power to service-entrance equipment of project.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering meter sockets which may be incorporated in the work include, but are not limited to, the following:
  - a. Milbank
  - b. Murray
  - c. Square D

E. Raceways:

1. General: Provide raceways complying with Division-16 Basic Electrical Materials and Methods section "Raceways", in accordance with the following listing:
  - a. Rigid Steel Conduit, and fittings.

**2.2 SERVICE-ENTRANCE ACCESSORIES:**

- A. Wall and Floor Seals: Provide wall and floor seals complying with Division-16 Basic Electrical Materials and Methods section "Supporting Devices", in accordance with the following listing:
  1. Wall and Floor Seals.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

- A. Examine areas and conditions under which service-entrance equipment and components are to be installed, and notify Design Builder in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until satisfactory conditions have been corrected in a manner acceptable to Installer.

**3.2 INSTALLATION OF SERVICE-ENTRANCE EQUIPMENT:**

- A. Install service-entrance equipment as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure

that service-entrance equipment fulfills requirements. Comply with applicable installation requirements of NEC and NEMA standards.

- B. Install fuses, in service-entrance equipment.
- C. Install ground-fault protection devices complying with electrical winding polarities if required per NEC for respective service.
- D. Install units on vibration isolators in accordance with Division-15 section; and comply with manufacturer's indicated method of installation.
- E. Set field-adjustable GFP devices and circuit breakers for pickup and time-current sensitivity ranges as required, subsequent to installation of devices and CB's.
- F. Install fuses, of size required, in each switchgear.
- G. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A and B, and the National Electrical Code.

### **3.3 FIELD QUALITY CONTROL:**

- A. Prior to energization of service-entrance equipment, check accessible connections for compliance to manufacturer's torque tightening specifications.
- B. Prior to energization of service-entrance equipment, check with ground resistance tester, phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
- C. Prior to energization, check circuitry for electrical continuity, and for short-circuits.

### **3.4 GROUNDING:**

- A. Provide equipment grounding connections for service-entrance equipment as indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounding.

### **3.5 ADJUSTING AND CLEANING:**

- A. Adjust operating mechanisms for free mechanical movement.
- B. Touch-up scratched or marred enclosure surfaces to match original finishes.

**3.6 DEMONSTRATION:**

- A. Upon completion of installation of service-entrance equipment and electrical circuitry, energized circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and retest to demonstrate compliance.

END OF SECTION 16420



## **SECTION 16452 - GROUNDING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes solid grounding of electrical systems and equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other sections of these Specifications.

#### **1.2 SUBMITTALS**

- A. General: Submit the following.
- B. Product data for ground rods, connectors and connection materials, and grounding fittings.
- C. Field-testing organization certificate, signed by the Design Builder, certifying that the organization performing field tests complies with the requirements specified in Quality Assurance below.
- D. Report of field tests and observations certified by the testing organization.

#### **1.3 QUALITY ASSURANCE**

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.
  - 1. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Field-Testing Organization Qualifications: To qualify for acceptance, the independent testing organization must demonstrate, based on evaluation of organization-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.
- C. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code" (NEC).
- D. UL Standard: Comply with UL 467, "Grounding and Bonding Equipment."

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Anixter Bros., Inc.
  2. Bashlin Industries, Inc.
  3. Dossert Corp.
  4. Erico Products, Inc.
  5. Galvan Industries, Inc.
  6. GB Electrical, Inc.
  7. Ideal Industries, Inc.
  8. Kearney-National.
  9. O-Z/Gedney Co.
  10. Raco, Inc.
  11. Thomas & Betts Corp.

**2.2 GROUNDING AND BONDING PRODUCTS**

- A. Products: Of types, sizes and ratings to comply with NEC.
- B. Conductor Materials: Copper.

**2.3 WIRE AND CABLE CONDUCTORS**

- A. General: Comply with Division 16 Section "Wires and Cables." Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
- B. Equipment Grounding Conductor: Green insulated.
- C. Grounding Electrode Conductor: Stranded cable.
- D. Bare Copper Conductors: Conform to the following:
2. Solid Conductors: ASTM B-3.
  2. Assembly of Stranded Conductors: ASTM B-8.
  3. Tinned Conductors: ASTM B-33.

**2.4 MISCELLANEOUS CONDUCTORS**

- A. Ground Bus: Bare annealed copper bars of rectangular cross section.
- B. Braided Bonding Jumpers: Copper tape, braided No. 30 gage bare copper wire, terminated with copper ferrules.
- C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2 inches wide.

## 2.5 CONNECTOR PRODUCTS

- A. General: Listed and labeled as grounding connectors for the materials used.
- B. Pressure Connectors: High-conductivity-plated units.
- C. Bolted Clamps: Heavy-duty units listed for the application.
- D. Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.
- E. Aluminum-To-Copper Connections: Bimetallic type, conforming to UL 96, "Lighting Protection Components," or UL 467.

## 2.6 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel with high-strength steel core and electrolytic-grade copper outer sheath, molten welded to core.
  - 1. Size: 3/4 inch by 10 feet.
  - 2. Size: 5/8 inch by 8 feet.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors.
  - 1. Install separate insulated equipment grounding conductors with circuit conductors for the following in addition to those locations where required by Code:
    - a. Feeders and branch circuits.
    - b. Lighting circuits.
    - c. Receptacle Circuits.

- d. Single-phase motor or appliance circuits.
  - e. Three-phase motor or appliance branch circuits.
- 2. Nonmetallic Raceways: Install an insulated equipment ground conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- B. Underground Conductors: Bare, stranded copper #2 AWG, unless otherwise noted.
- C. Signal and Communications: For telephone, alarm, and communication systems, provide green insulated copper conductor in raceway from the grounding electrode system to each terminal cabinet or central equipment location. Sized per Manufacturer and NEC requirements.
- D. Separately derived systems required by NEC to be grounded shall be grounded in accordance with NEC paragraph 250.30.
- E. Metal Poles Supporting Outdoor Lighting Fixtures: Ground pole to a grounding electrode in addition to separate equipment grounding conductor run with supply branch circuit.

### 3.2 INSTALLATION

- A. General: Ground electrical systems and equipment in accordance with NEC requirements except where Drawing or Specifications exceed NEC requirements.
- B. Ground Rods: Locate a minimum of one-rod length from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 30 inches below grade. Connect bare-cable ground conductors to ground rods by means of exothermic welds. Make these connections without damaging the copper coating or exposing the steel. Use 3/4-inch by 10-ft. ground rods except as otherwise indicated. Drive rods until tops are 6 inches below finished floor or final grade.
- C. Metallic Water Service Pipe: Provide insulated copper ground conductors, sized per NEC, in conduit from the building main service equipment, or the ground bus, to main metallic water service entrances to the building. Connect ground conductors to the main metallic water service pipes by means of ground clamps. Where a dielectric main water fitting is installed, connect the ground conductor to the street side of the fitting. Do not install a grounding jumper around dielectric fittings. Bond the ground conductor conduit to the conductor at each end.

- D. Braided-Type Bonding Jumpers: Install to connect ground clamps on water meter piping to bypass water meters electrically. Use elsewhere for flexible bonding and grounding connections.
- E. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- F. Bond interior metal piping systems and metal air ducts to equipment ground conductors of pumps, fans, electric heaters, and air cleaners serving individual systems.

### **3.3 CONNECTIONS**

- A. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
  - 2. Make connections with clean bare metal at points of contact.
  - 3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.
  - 4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.
  - 5. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
- B. Exothermic Welded Connections: Use for connections to structural steel and for underground connections except those at test wells. Install at connections to ground rods and plate electrodes. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.

- D. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.
- E. Compression-Type Connections: Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.
- F. Moisture Protection: Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.

### 3.4 FIELD QUALITY CONTROL

- A. Independent Testing Organization: Arrange and pay for the services of a qualified independent electrical testing organization to perform tests described below.
- B. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground resistance level is specified, at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System."
- C. Ground/resistance maximum values shall be as follows:
  - 1. Equipment rated 500 kVA and less: 5 Ohms
  - 2. Equipment rated 500 kVA to 1000 kVA: 5 Ohms
  - 3. Equipment rated over 1000 kVA: 3 Ohms
  - 4. Pad-mounted equipment: 5 Ohms
- D. Deficiencies: Where ground resistances exceed specified values, modify the grounding system to reduce resistance values.
- E. Report: Prepare test reports, certified by the testing organization, of the ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

**3.5 CLEANING AND ADJUSTING**

- A. Restore surface features at areas disturbed by excavation and reestablish original grades except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other Work to their original condition. Include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, or mulching. Maintain disturbed surfaces. Restore vegetation. Restore disturbed paving.

END OF SECTION 16452

**SECTION 16470 - PANELBOARDS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes lighting and power panelboards and associated auxiliary equipment rated 600 V or less.

**1.2 SUBMITTALS**

- A. General: Submit the following:
- B. Product data for each type panelboard, accessory item, and component specified.
- C. Shop drawings from manufacturers of panelboards including dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features, and voltage rating. Include the following:
  - 1. Enclosure type with details for types other than NEMA Type 1.
  - 2. Bus configuration and current ratings.
  - 3. Short-circuit current rating of panelboard.
  - 4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.
  - 5. Spare Fuse Cabinets: Show materials, dimensions, and features including storage provisions for fuse cartons.
- D. Wiring diagrams detailing schematic diagram including control wiring, and differentiating between manufacturer-installed and field-installed wiring.
- E. Qualification data for field-testing organization certificates, signed by the Contractor, certifying that the organization complies with the requirements specified in Quality Assurance below. Include list of completed projects with project names, addresses, and names of Architect and Owner plus basic organization qualifications data.
- F. Report of field tests and observations certified by the testing organization.
- G. Panel schedules for installation in panelboards. Submit final versions after load balancing.
- H. Maintenance data for panelboard components, for inclusion in Operating and Maintenance Manual. Include instructions for testing circuit breakers.



**1.3 QUALITY ASSURANCE**

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
  - 1. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Field-Testing Organization Qualifications: To qualify for acceptance, the independent testing organization must demonstrate, based on evaluation of organization-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.
- C. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- D. NEMA Standard: Comply with NEMA PB1, "Panelboards."
- E. UL Standards: Comply with UL 61, "Panelboards," and UL 50, "Cabinets and Boxes."

**1.4 EXTRA MATERIALS**

- A. Keys: Furnish six spares of each type for panelboard cabinet locks.
- B. Touch-up Paint for surface-mounted panelboards: One half-pint container.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Eaton Corp.
  - 2. General Electric Co.
  - 3. Square D Co.

**2.2 PANELBOARDS, GENERAL REQUIREMENTS**

- A. Overcurrent Protective Devices (OCPDs): Provide type, rating, and features as required by code. Comply with Division 16 Section "Overcurrent Protective Devices," with OCPDs adapted to panelboard installation. Tandem circuit breakers shall not be used. Multipole breakers shall have common trip.
- B. Enclosures: NEMA 1 Cabinets, flush or surface mounted as required for installation location.
- C. Front: Secured to box with concealed trim clamps. Front for surface-mounted panels shall be same dimensions as box. Fronts for flush panels shall overlap box.
- D. Directory Frame: Metal, mounted inside each panel door.
- E. Bus: Hard drawn copper of 98 percent conductivity.
- F. Main and Neutral Lugs: Compression type.
- G. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors. Bonded to box.
- H. Service Equipment Approval: Listed for use as service equipment for panelboards having main service disconnect.
- I. Provision for Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for future installation of devices.
- J. Special Features: Provide the following features for panelboards.
  - 1. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box as indicated.
  - 2. Hinged Front Cover: Entire front trim hinged to box with standard door within hinged trim cover.
  - 3. Skirt For Surface-Mounted Panels: Same gage and finish as panel front with flanges for attachment to panel, wall, and floor.
  - 4. Control Power Source: Control power transformer of capacity require, for contactor shunt trip or other devices. Mount in cabinet of panel. Protect primary with current-limiting OCPD. Provide fused protection of control circuits.
  - 5. Extra Gutter Space: Dimensions and arrangement as required.
  - 6. Gutter Barrier: Arranged to isolate section of gutter as required.
  - 7. Subfeed: OCPD or lug provision as indicated.
- K. Feed-Through Lugs: Sized to accommodate feeders.

- L. Surge Arresters: IEEE C62.11, "Standards for Metal-Oxide Surge Arresters for AC Power Circuits," or IEEE C62.1, "Surge Arresters for Alternating Current Power Circuits."
  - 1. Description: Coordinate impulse sparkover voltage with system circuit voltage and provide factory mounting with UL-recognized mounting device.

### 2.3 LIGHTING AND APPLIANCE BRANCH CIRCUIT PANELBOARDS

- A. Branch OCPDs: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Double-Width Panels: Where more than 42 poles are required, provide two panelboards under single front.
- C. Doors: In panel front, with concealed hinges. Secure with flush catch and tumbler lock, all keyed alike.

### 2.4 DISTRIBUTION PANELBOARDS

- A. Doors: In panel front, omit single panelboard door in cabinet front for fusible switch panelboards. Secure with vault-type with tumbler lock, all keyed alike.
- B. Branch-Circuit Breakers: Where OCPDs are to be circuit breakers, use bolt-on breakers except circuit breakers 225-ampere frame size and greater may be plug-in type where individual positive locking device requires mechanical release for removal.

### 2.5 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items as required for overcurrent protective device test, inspection, maintenance, and operation.

### 2.6 IDENTIFICATION

- A. General: Refer to Division 16 Section "Electrical Identification" for labeling materials.
- B. Panelboard Nameplates: Engraved laminated plastic or metal nameplate for each panelboard mounted with epoxy or industrial cement or industrial adhesive.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. General: Install panelboards and accessory items in accordance with NEMA PB 1.1, "General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less" and manufacturers' written installation instructions.
- B. Ground Fault Protection: Install panelboard ground fault circuit interrupter devices in accordance with installation guidelines of NEMA 289, "Application Guide for Ground Fault Circuit Interrupters."
- C. Mounting Heights: Top of trim 6'-2" above finished floor.
- D. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish.
- E. Circuit Directory: Typed and reflective of final circuit changes required to balance panel loads. Obtain approval before installing.
- F. Install filler plates in unused spaces.
- G. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch empty conduits from panel into accessible ceiling space or space designated to be ceiling space in future. Stub four 1-inch empty conduits into raised floor space or below slab other than slabs on grade.
- H. Auxiliary Gutter: Install where a panel is tapped to a riser at an intermediate location.
- I. Wiring in Panel Gutters: Train conductors neatly in groups, bundle, and wrap with wire ties after completion of load balancing.

**3.2 IDENTIFICATION**

- A. Identify field-installed wiring and components and provide warning signs in accordance with Division 16 Section "Electrical Identification."

**3.3 GROUNDING**

- A. Connections: Make equipment grounding connections for panelboards as required by code.

- B. Provide ground continuity to main electrical ground bus.

### **3.4 CONNECTIONS**

- A. Tighten electrical connectors and terminals, including grounding connections, in accordance with manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### **3.5 FIELD QUALITY CONTROL**

- A. Independent Testing Organization: Arrange and pay for the services of an independent electrical testing organization in to perform tests on low-voltage power panelboards and accessories.
- B. Pretesting: Upon completing installation of the system, perform the following preparations for independent tests:
  - 1. Make insulation resistance tests of panelboard buses, components, and connecting supply, feeder, and control circuits.
  - 2. Make continuity tests of circuits.
  - 3. Provide set of Contract Documents to test organization. Include full updating on final system configuration and parameters where they supplement or differ from those indicated in original Contract Documents.
- C. Quality Control Program: Conform to the following:
  - 1. Procedures: Make field tests and inspections and prepare panelboard for satisfactory operation in accordance with manufacturer's recommendations and these specifications.
  - 2. Schedule tests with at least one week in advance notification.
  - 3. Reports by Testing Organization: Report written reports of tests and observations. Report defective materials and workmanship and unsatisfactory test results. Include records of repairs and adjustments made.
  - 4. Labeling: Upon satisfactory completion of tests and related effort, apply a label to tested components indicating results of tests and inspections, responsible organization and person, and date.
  - 5. Protective Device Ratings and Settings: Verify indicated ratings and settings to be appropriate for final system configuration and parameters. Where discrepancies are found, recommend final protective device ratings and settings. Use accepted ratings or settings to make the final system adjustments.

- D. Visual and Mechanical Inspection: Include the following inspections and related work:
1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date drawings and panelboard schedules.
  2. Exercise and perform of operational tests of all mechanical components and other operable devices in accordance with manufacturer's instruction manual.
  3. Check panelboard mounting, area clearances, and alignment and fit of components.
  4. Check tightness of bolted electrical connections with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.
  5. Perform visual and mechanical inspection and related work for overcurrent protective devices as specified in Division 16 Section "Overcurrent Protective Devices."
- E. Electrical tests: Include the following items performed in accordance with manufacturer's instruction:
1. Insulation resistance test of buses and portions of control wiring that disconnected from solid-state devices. Insulation resistance less than 100 megohms is not acceptable.
  2. Ground resistance test on system and equipment ground connections.
  3. Test main and subfeed overcurrent protective devices in accordance with Section "Overcurrent Protective Devices."
- F. Retest: Correct deficiencies identified by tests and observations and provide retesting of panelboards by testing organization. Verify by the system tests that the total assembly meets specified requirements.

### 3.6 CLEANING

- A. Upon completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

### 3.7 COMMISSIONING

- A. Balancing Loads: After Substantial Completion, but not more than two months after Final Acceptance, conduct load-balancing measurements and circuit changes as follows:
1. Perform measurements during period of normal working load as advised by the Owner.

2. Perform load-balancing circuit changes outside the normal occupancy/working schedule of the facility. Make special arrangements with Owner to avoid disrupting critical 24-hour services such as FAX machines and on-line data processing, computing, transmitting, and receiving equipment.
  3. Recheck loads after circuit changes during normal load period. Record all load readings before and after changes and submit test records.
  4. Tolerance: Difference between phase loads exceeding 20 percent at any one panelboard is not acceptable. Rebalance and recheck as required to meet this minimum requirement.
- B. Infrared Scanning: After Substantial Completion, but not more than two months after Final Acceptance, perform an infrared scan of each panelboard. Remove fronts to make joints and connections accessible to a portable scanner.
- C. Follow-up Infrared Scanning: Perform one additional follow-up infrared scan of each panelboard 11 months after the date of Substantial Completion.
- D. Instrument: Use an approved infrared scanning device designed to measure temperature or detect significant deviations from normal values. Provide calibration record for device used.
- E. Record of Infrared Scanning: Prepare a certified report identifying panelboards checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 16470

## **SECTION 16475 - OVERCURRENT PROTECTIVE DEVICES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes overcurrent protective devices (OCPDs) rated 600 V and below and switching devices commonly used with them.
- B. Panelboards, Switchboards, and Motor Control Centers: Application, installation, and other related requirements for overcurrent protective device installations in distribution equipment are specified in other Division 16 sections.

#### **1.2 SUBMITTALS**

- A. General: Submit the following.
- B. Product data for fuses, fusible switches, circuit breakers, and OCPD accessories specified in this Section, including descriptive data and time-current curves for all protective devices and let-through current curves for those with current limiting characteristics. Include coordination charts and tables and related data.
- C. Coordination study performed by a registered professional engineer in accordance with ANSI/IEEE Standard 242-1986, "Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems." Show graphically how overcurrent protective devices coordinate selectively with both upstream and downstream components. Include single line diagram, coordinated time-current characteristics, device performance curves, and fault current calculations adequate to demonstrate satisfactory component protection and selective coordination of protective devices.

#### **1.3 QUALITY ASSURANCE**

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
  - 1. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.



- C. Single-Source Responsibility: Obtain similar OCPDs from a single manufacturer.

#### **1.4 EXTRA MATERIALS**

- A. Maintenance Stock, Fuses: For types and ratings required, furnish spare fuses, amounting to one unit for every 5 installed units, but not less than one set of 3 of each kind.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Cartridge Fuses:
    - a. Bussmann, Cooper Industries, Inc.
    - b. Ferraz Shawmut
    - c. General Electric Co.
    - d. Littelfuse Inc.
  2. Fusible Switches:
    - a. Allen-Bradley Co.
    - b. Eaton Corp.
    - c. General Electric Co.
    - d. Siemens Energy & Automation, Inc.
    - e. Square D Co.
  3. Molded-Case Circuit Breakers:
    - a. Eaton Corp.
    - b. General Electric Co.
    - c. Siemens Energy & Automation, Inc.
    - d. Square D Co.
  4. Molded-Case Current-Limiting Circuit Breakers:
    - a. Eaton Corp.
    - b. General Electric Co.

- c. Siemens Energy & Automation, Inc.
  - d. Square D Co.
- 5. Molded-Case Circuit Breakers With Solid-State Trip Devices:
  - a. Eaton Corp.
  - b. General Electric Co.
  - c. Siemens Energy & Automation, Inc.
  - d. Square D Co.
- 6. Insulated-Case Circuit Breakers:
  - a. Eaton Corp.
  - b. General Electric Co.
  - c. Siemens Energy & Automation, Inc.
  - d. Square D Co.

## **2.2 OVERCURRENT PROTECTIVE DEVICES (OCPDs), GENERAL**

- A. General: Provide OCPDs in types, as integral components of panelboards, switchboards, and motor control centers; and also as individually enclosed and mounted single units.
- B. Enclosures: NEMA 250 "Enclosures for Electrical Equipment (1,000 Volts Maximum)."

## **2.3 CARTRIDGE FUSES**

- A. General: NEMA Standard FU1, "Low-Voltage Cartridge Fuses." Provide nonrenewable cartridge fuses of required types, classes, and current ratings that have voltage ratings consistent with the circuits on which used.
- B. Class L Fuses: UL 198C, "High-Interrupting Capacity Fuses, Current-Limiting Type."
- C. Class RK1 and RK5 Dual Element Time-Delay Fuses: UL 198E, "Class R Fuses."

## **2.4 FUSIBLE SWITCHES**

- A. General: UL 98 "Enclosed and Dead Front Switches" and NEMA KS 1 "Enclosed Switches," quick-make, quick-break heavy-duty units.
- B. Rating: Load-breaking capacity in excess of the normal horsepower rating for the switch.

- C. Withstand Capability: In excess of the let-through current permitted by its fuse when subject to faults up to 100,000 RMS symmetrical amperes.
- D. Operation: By means of external handle.
- E. Interlock: Prevents access to switch interior except when in "off" position.
- F. Fuse Clips: Rejection type.
- G. Padlocking Provisions: For 2 padlocks, whether open or closed.
- H. Enclosure for Independent Mounting: NEMA Type enclosure required to suit environment where located.

## **2.5 MOLDED-CASE CIRCUIT BREAKERS**

- A. General: UL 489, "Molded Case Circuit Breakers and Circuit Breaker Enclosures," and NEMA AB 1, "Molded Case Circuit Breakers."
- B. Construction: Bolt-in type, except breakers 225-ampere frame size and larger may be plug-in type if held in place by positive locking device requiring mechanical release for removal.
- C. Characteristics: Provide frame size, trip rating, number of poles, required for installation and code compliance and provide short-circuit interrupting capacity rating of 10,000 amperes symmetrical, unless a greater rating is required.
- D. Tripping Device: Quick-make, quick-break toggle mechanism with inverse-time delay and instantaneous overcurrent trip protection for each pole.
- E. Adjustable Instantaneous Trip Devices: Factory adjusted to low-trip-setting current values.
- F. Enclosure for Switchboard or Panelboard Mounting: Suitable for panel mounting in switchboard or panelboards.
- G. Enclosure for Independent Mounting: NEMA Type 1 enclosure, except as otherwise required to suit environment where located.
- H. Current-Limiting Circuit Breakers: Arranged to limit let-through ampere-squared-seconds during fault conditions to a value less than the ampere-squared-seconds of one-half-cycle wave of the prospective symmetrical fault

current. The circuit breaker shall use no fusible devices in its operation. The current-limiting characteristic shall be in addition to normal time-delay and instantaneous-trip characteristics and other features.

- I. Circuit Breakers With Solid-State Trip Devices: Provide required circuit breakers with solid-state trip devices having the following features:
  - 1. Ambient Compensation: Trip device insensitive to temperature changes between minus 20 deg C and plus 55 deg C.
  - 2. Adjustability: Breaker ratings and trip settings shall be changeable by operation of controls on front panel of breaker, by change of plug-in element without removing breaker from mounting, or by a combination of the two methods.
  - 3. Ground-Fault Tripping: Adjustable for pick-up and time-delay values. Provide for required units.

## 2.6 OCPD ACCESSORIES

- A. Key Interlocks: Arrange interlocking so keys are held captive at devices required. Where future key interlocking provisions are required, provide necessary mountings and hardware as required for the future installation.
- B. Instantaneous Undervoltage Trip Device: For OCPDs.
- C. Adjustable-Time-Delay Undervoltage Trip Devices: For OCPDs.
- D. Shunt-Trip Devices for Circuit Breakers: Where required, arrange to trip breaker from an external source of power through a control switch or relay contacts.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Independently Mounted OCPDs: Locate as required for code compliance and install in accordance with manufacturer's written installation instructions.
- B. OCPDs in distribution equipment shall be factory installed.

### 3.2 IDENTIFICATION

- A. Identify components in accordance with Division 16 Section "Electrical Identification."

### 3.3 CONTROL WIRING INSTALLATION

- A. Install wiring between OCPDs and control/indication devices as specified in Division 16 Section "Wires and Cables" for hard wired connections.

### 3.4 CONNECTIONS

- A. Check connectors, terminals, bus joints, and mountings for tightness. Tighten field-connected connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.

### 3.5 GROUNDING

- A. Provide equipment grounding connections for individually mounted OCPD units as required by NEC. Tighten connectors to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounding.

### 3.6 FIELD QUALITY CONTROL

- A. Independent Testing Organization: Arrange and pay for the services of an independent electrical testing organization to perform tests and observations on OCPDs.
- B. Reports: Prepare written reports certified by testing organization on tests and observations. Report defective materials and workmanship and unsatisfactory test results. Include complete records of repairs and adjustments made.
- C. Labeling: Upon satisfactory completion of tests and related effort, apply a label to tested components indicating test results, date, and responsible organization and person.
- D. Schedule visual and mechanical inspections and electrical tests with at least one week's advance notification.
- E. Pretesting: Upon completing installation of the system, perform the following preparations for independent tests:
  - 1. Make insulation resistance tests of OCPD buses, components, and connecting supply, feeder, and control circuits.
  - 2. Make continuity tests of circuits.

3. Provide set of Contract Documents to test personnel. Include full updating on final system configuration and parameters where they supplement or differ from those indicated in original Contract Documents.
  4. Provide manufacturer's instructions for installation and testing of OCPDs to test personnel.
- F. Visual and mechanical inspection: Include the following inspections and related work.
1. Overcurrent-Protective-Device Ratings and Settings: Verify indicated ratings and settings to be appropriate for final system arrangement and parameters. Where discrepancies are found, test organization shall recommend final protective device ratings and settings. Use accepted revised ratings or settings to make the final system adjustments.
  2. Inspect for defects and physical damage, NRTL labeling, and nameplate compliance with current single line diagram.
  3. Exercise and perform operational tests of all mechanical components and other operable devices in accordance with manufacturer's instruction manual.
  4. Check tightness of electrical connections of OCPDs with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.
  5. Clean OCPDs using manufacturer's approved methods and materials.
  6. Verify installation of proper fuse types and ratings in fusible OCPDs.
- G. Electrical Tests: Include the following items performed in accordance with manufacturer's instructions:
1. Insulation resistance test of OCPD conducting parts. Insulation resistance less than 100 megohms is not acceptable.
  2. Contact resistance test or measurement of millivolt drop across contacts of drawout circuit breakers and fused power circuit devices at rated current. Compare contact resistance or millivolt drop values of adjacent poles and of similar breakers. Deviations of more than 50 percent are not acceptable.
  3. Insulation resistance test of fused power circuit devices and insulated-case and molded-case circuit breakers over 600-ampere frame size at 1000 V d.c. for one minute from pole to pole and from each pole to ground with breaker closed and across open contacts of each phase. Insulation resistance less than 100 megohms is not acceptable.
  4. Use primary current injection to check performance characteristics of trip units of insulated-case circuit breakers and molded-case breakers over 600-ampere frame size. Trip characteristics not falling within manufacturer's published time-current characteristic tolerance bands when adjusted to approved parameters are not acceptable. Perform the following tests:

- a Determine minimum pickup current acceptable per manufacturer's instructions.
  - b Determine long-time delay at 300 percent pickup current.
  - c Determine short-time-pickup current and corresponding delay time.
  - d Determine ground-fault current pickup and corresponding delay time.
  - e Determine instantaneous pickup current value.
- 
- 5 Verify trip unit reset characteristics for insulated-case circuit breakers.
  - 6 Make adjustments for final settings of adjustable-trip devices.
  - 7 Activate auxiliary protective devices such as ground fault or undervoltage relays, to verify operation of shunt-trip devices.
  - 8 Check stored-energy charging motors for proper operation of motor, mechanism, and limit switches.
  - 9 Check operation of electrically operated OCPDs in accordance with manufacturer's instructions.
  - 10 Check key and other interlock and safety devices for operation and sequence. Make closing attempts on locked-open and opening attempts on locked-closed devices including moveable barriers and shutters.
- 
- H Retest: Correct deficiencies identified by tests and observations and provide retesting of OCPDs by testing organization. Verify by the system tests that specified requirements are met.

### **3.7 CLEANING**

- A. Upon completion of installation, inspect OCPDs. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

### **3.8 DEMONSTRATION**

- A. Training: Arrange and pay for the services of factory-authorized service representatives to demonstrate OCPDs and train Owner's maintenance personnel.
- B. Conduct a minimum of one half day of training in operation and maintenance as specified under "Instructions to Owner Employees" in the "Project Closeout" Section of these specifications. Include both classroom training and hands-on equipment operation and maintenance procedures.
- C. Schedule training with at least seven days' advance notification.

### **3.9 COMMISSIONING**

- A. Infrared Scanning: After Substantial Completion, but not more than 2 months after Final Acceptance, perform an infrared scan of OCPDs including their line and load connections, fuses, and fuse clips. Also scan OCPD contact structures where accessible to a portable scanner. Include individual OCPDs and those installed in switchboards, panelboards, and motor control centers.
- B. Follow-up Infrared Scanning: Perform two additional follow-up infrared scans of the same devices: one four months after Substantial Completion, and one 11 months after Substantial Completion.
- C. Instrument: Use an infrared scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
- D. Record of Infrared Scanning: Prepare a certified report identifying all OCPDs checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and rescanning observations after remedial action.

END OF SECTION 16475



**SECTION 16495 – AUTOMATIC TRANSFER SWITCHES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. All of the Contract Documents, including General and Supplementary Conditions Bidding Documents, Contract Forms and Conditions of the Contract and Division 1 - General Requirements, apply to the work of this Section.
- B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all specifications sections and other Contract Documents.

**1.2 SUMMARY**

- A. This Section includes transfer switches rated 600 V and under. It includes the following items:
  - 1. Automatic transfer switch. (ATS)
  - 2. Remote annunciation system.

**1.3 REMOTE ANNUNCIATION SYSTEM**

- A. Functional Description: Provide annunciation at a remote annunciator panel of conditions at indicated transfer switches as follows:
  - 1. Sources available (as defined by actual pick up and dropout settings of ATS controls).
  - 2. Switch position.
  - 3. Switch in test mode.
  - 4. Switch controls in time delay sequence.
  - 5. Failure of communication link.

**1.4 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract.
- B. Product data for each transfer switch including dimensioned plans, sections, and elevations showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and materials lists.
- C. Wiring diagrams, elementary or schematic, differentiating between manufacturer installed and field installed wiring.
- D. Single line diagram of the unit showing connections between the automatic transfer switch, the power source and the load, plus interlocking provisions.
- E. Operation and maintenance data for products, for inclusion in Operating and Maintenance Manual specified in Division 1 and in Division 16 Section "Basic

Electrical Requirements." Operating and maintenance data shall cover each type of product, including all features and operating sequences, both automatic and manual. List all factory settings of relays and provide relay setting and calibration instructions. Provide spare parts data.

- F. Manufacturer's certificate of compliance to the referenced standards and manufacturer's certification of tested short circuit closing and withstand ratings.

### **1.5 QUALITY ASSURANCE**

- A. Electrical Component Standard: Comply with NFPA 70 "National Electrical Code" for components and installation.
- B. NFPA Compliance: Comply with NFPA Standard 99, "Standard for Essential Electrical Systems for Health Care Facilities," and NFPA Standard 110, "Standard for Emergency and Standby Power Systems."
- C. NEMA Compliance: Comply with NEMA standards: ICS 1, "General Standards for Industrial Control"; ICS 2, "Industrial Control Devices, Controllers and Assemblies"; and ICS 6, "Enclosures for Industrial Controls and Systems."
- D. UL Listing and Labeling: Provided items specified in this section that are listed and labeled by UL for emergency service under UL 1008.
- E. Nationally Recognized Testing Laboratory Listing and Labeling (NRTL): Provided items specified in this section that are listed and labeled by a NRTL for emergency service under UL 1008. The term "NRTL" shall be as defined in OSHA Regulation 1910.7.
- F. UL Compliance: Comply with UL Standard 1008, "Automatic Transfer Switches," except where requirements of these specifications are stricter.
- G. Single Source Responsibility: Obtain ATSS, remote annunciators, and remote annunciator and control panels from a single manufacturer who assumes responsibility for all system components furnished.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
  - 1. ASCO
  - 2. Caterpillar

3. Cummins
4. Kohler.

## 2.2 TRANSFER SWITCH PRODUCTS, GENERAL

- A. General: The following requirements apply to automatic transfer switch and related switch products:
- B. Ratings: Provide number of poles and current and voltage ratings as indicated. Current ratings for units below 600 amperes shall be identical for all classes or mixtures of loads including 100 percent tungsten filament lamp or 100 percent inductive.
- C. Tested Fault Current Rating: Exceed the indicated available rms symmetrical fault current at the equipment terminals for closing and withstand ratings based on testing in accordance with UL 1008, conducted at full rated system voltage and 20 percent power factor. Test each product for withstand duration time for rated short circuit current correlated with the actual type of circuit protective device indicated for the transfer switch as follows:
  1. Molded Case Circuit Breakers, 150 Amperes or Less: 1.5 closing and withstand duration cycles.
  2. Molded Case Circuit Breakers, Over 150 Amperes: 3 closing and withstand duration cycles.
- D. Solid State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 deg C to 70 deg C. Components shall meet or exceed voltage surge withstand capability when tested in accordance with ANSI Standard C37.90.1, "IEEE Guide for Surge Withstand Capability (SWC) Tests."
- E. Neutral Terminal: Where two or three pole switches are indicated, provide fully rated, solid, unswitched neutral terminal except as indicated.
- F. Enclosures: Provide NEMA 4X in accordance with UL 508, "Electric Industrial Control Equipment,".
- G. Factory Wiring: Train and bundle factory wiring and identify consistently with shop drawings, either by color code or by numbered or lettered wire and cable tape markers at all terminations. Provide designated terminal blocks for field wiring, and arrange power terminal and field wiring space to be suitable for top, side, or bottom entrance of feeder conductors as indicated. Provide pressure type terminals suitable for copper or aluminum conductors of sizes indicated.
- H. Electrical operation, where indicated, shall be accomplished by a nonfused momentarily energized solenoid or electric motor operated mechanism, mechanically and electrically interlocked in both directions. Transfer switches utilizing molded case

circuit breakers/switches are not acceptable. Contactors not designed for continuous duty repetitive switching between active power sources are not acceptable.

- I. Switch action for double throw type switches shall be mechanically held in both directions.
- J. Switch Contacts: Silver composition for switching load current with separate arcing contacts where rated 400 amperes and above.
- K. Heater: Provide thermostatically controlled internal heater for enclosure. Wattage as recommended by manufacturer for enclosure size.

### 2.3 AUTOMATIC TRANSFER SWITCHES (ATSs)

- A. Comply with requirements for Level 1 equipment per NFPA 110, "Standard for Emergency and Standby Power Systems."
- B. Features and Characteristics: Include the following:
  - 1. Double throw type switching arrangement, incapable of pauses or intermediate position stops during normal functioning except as indicated.
  - 2. Manual Operator: Capable of transferring the switch to either source position for maintenance purposes. Control circuit shall be disconnected from electrical operator during manual operation.
- C. Accessories: Provide the following ATS accessories:
  - 1. Close differential voltage sensing on each phase of normal source. Pick up voltage shall be adjustable from 85 percent to 100 percent of nominal, and dropout shall be adjustable from 75 percent to 98 percent of the pick up value. Factory set for pick up at 90 percent and dropout at 85 percent. Provide phase monitoring for both (normal and emergency) sources.
  - 2. Time delay override of normal source voltage sensing shall delay all transfer and engine start signals. Adjustable 0 to 6 seconds, and factory set at 1 second.
  - 3. Voltage/frequency lockout relay and sensing of the emergency source shall be provided to prevent premature transfer. Voltage pick up shall be adjustable from 85 to 100 percent of nominal. Factory set to pick up at 90 percent of nominal. Pick up frequency shall be adjustable from 90 percent to 100 percent of nominal. Factory set to pick up at 95 percent.
  - 4. System test switch, momentary type.
  - 5. Retransfer time delay to normal or preferred power source: adjustable from 0 to 30 minutes and factory set at 30 minutes. Provide automatic defeat of the delay upon loss of voltage or sustained under voltage of the emergency source, provided the normal supply has been restored.
  - 6. Pilot lights to indicate source to which the load is connected.
  - 7. Engine starting contacts, one isolated normally closed and one isolated normally open. Contacts shall be gold flashed or plated and rated 10 amperes at 32 V d.c.

8. Engine Shutdown Contacts: Instantaneous, to initiate shutdown sequence at remote engine generator controls after retransfer of the load to normal or preferred source.
9. Unassigned Auxiliary Contacts: Two normally open SPDT contacts for each switch position.
  - a. Rating: 10 amperes at 240 V a.c.
10. Source Available Indicating Lights: A green indicating light to supervise the normal power source with a nameplate engraved "NORMAL SOURCE AVAILABLE," and a red indicating light to supervise the emergency power source with a nameplate engraved "EMERGENCY SOURCE AVAILABLE." Supervision of sources shall be via the transfer switch normal and emergency source sensing circuits, respectively.
11. Transfer Override Switch: To override automatic retransfer control so the ATS will remain connected to the emergency power source regardless of the condition of the normal source. Provide a pilot light to indicate the override status.
12. Provide programmable generator exerciser.
13. Provide load shed kit to signal shutdown of chiller circuit #2 when building power is being provided by the generator.
14. Provide surge protection device (SPD) with L-L, L-N, L-G, N-G protection modes and replaceable phase and neutral cartridges. SPD shall be UL 1449, 3rd edition Type 2. Provide with 1 NO, 1 NC contacts.
15. Provide control panel with digital communication interface.

#### 2.4 REMOTE ANNUNCIATOR PANEL

- A. Type: Lamp type with audible signal, silencing switch, and labeled indicating lights, grouped for each transfer switch monitored.
- B. Mounting: Flush modular steel cabinet except as indicated.
- C. Lamp Test: Push to test or "lamp test" switch on front panel.

#### 2.5 WIRING

- A. Hard Wired Connections: Conform to Division 16 Section "Wires and Cables" for conductors between transfer switches and remote annunciator panels.
- B. Data Circuits: Provide as indicated and in accordance with generator and transfer switch equipment supplier. This applies to links between generators, automatic transfer switch equipment, and remote annunciator panels.

#### 2.6 FINISHES

- A. Clean ferrous surfaces to be painted free of oil, grease, welding slag, and spatter, mill scale, corrosion, and dirt.

- B. Paint with rust inhibiting primer and finish enamel. Apply primer to clean, dry surface immediately after cleaning. Use manufacturer's standard material and procedure except as required to produce a total dry film thickness not less than 2.5 mils. Use finish coat of manufacturer's approved standard color. Provide a finish free from runs, sags, peeling, and other defects.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Mounting of Transfer Switches: Level and anchor the unit to the building structure in accordance with manufacturer's recommendations.
- B. Annunciator Panel Mounting: Coordinate location with Owner.

### 3.2 CONTROL WIRING INSTALLATION

- A. Wiring Between Transfer Switches and Annunciator Panels: Install in metal raceway. Conform to other Division 16 requirements for hard wired connections.

### 3.3 CONNECTIONS

- A. Check connectors, terminals, bus joints, and mountings for tightness. Tighten field connected connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486.

### 3.4 GROUNDING

- A. Provide equipment grounding connections for transfer switch units as indicated and as required by NEC. Tighten connectors to comply with tightening torques specified in UL Standard 486 to assure permanent and effective grounding.

### 3.5 FIELD QUALITY CONTROL

- A. Preliminary Tests: Perform electrical tests as follows:
  - 1. Measure, with insulation resistance tester, phase to phase and phase to ground insulation resistance levels to assure requirements are fulfilled. Disconnect control circuits for this test to prevent damage.
  - 2. Check for electrical continuity of circuits and for short circuits.
- B. Manufacturer's Field Services: Provide services of a factory service representative to assist with demonstrations and field tests.
- C. Field Tests: Energize transfer switches and demonstrate functioning of all devices, components, and sequences. Give seven calendar days' advance notice of the tests, and perform tests in presence of Owner's representative.

- D. Tests shall be coordinated with tests of generator plant and run concurrently with them. Tests shall include the following:
- E. Tests for Transfer Switches: Demonstrate each sequence and operational function at least five times.
- F. Tests for ATSS: Include the following:
  - 1. Simulate power failure of normal source.
  - 2. Simulate power failure of emergency source with normal sources available.
  - 3. Simulate low phase to ground voltage for each phase of normal source.
- G. Checking, measuring, and optimizing all adjustable time delays.
- H. Test Failures: Correct deficiencies identified by tests and make ready for retest. Verify equipment meets the specified requirements.
- I. Reports: Maintain a written record of observations and tests. Report defective materials and workmanship and retest corrected defective items. Submit written test reports. Include a record of all adjustable relay settings and measured time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

### **3.6 DEMONSTRATION**

- A. Training: Furnish the services of a factory authorized service representative to instruct Owner's personnel in the operation and maintenance of transfer switches and related equipment. Provide a minimum of two (2) two hours sessions of instruction scheduled seven days in advance.

### **3.2 CLEANING**

- A. Upon completion of installation, inspect interiors and exteriors of accessible components. Remove dust, dirt, foreign matter, paint splatters and other spots, dirt, and construction debris. Vacuum interior. Touch up scratches and mars of finish to match original finish.

END OF SECTION 16495

**SECTION 16515 – INTERIOR LIGHTING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes interior lighting fixtures, lamps, ballasts, exit signs, and accessories.

**1.2 SUBMITTALS**

- A. General: Submit the following.
- B. Product data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange product data for fixtures in order of fixture designation. Include data on features and accessories and the following information:
  - 1. Outline drawings of fixtures indicating dimensions and principal features.
  - 2. Electrical ratings and photometric data with specified lamps and certified results of independent laboratory tests.
- C. Maintenance data for products for inclusion in Operating and Maintenance Manual specified in Division 1.
- D. Product certifications signed by manufacturers of lighting fixtures certifying that their fixtures comply with specified requirements.
- E. Shop drawings from manufactures detailing nonstandard fixtures and indicating dimensions, weights, methods of field assembly, components, features, and accessories.
- F. Coordination drawings for fixtures mounted on, in, or above the ceiling indicating coordination with ceiling grids and other equipment installed in the same space.
- G. Samples for verification purposes of specific individual fixtures.

**1.3 QUALITY ASSURANCE**

- A. Comply with NFPA 70 "National Electrical Code" for components and installation.
- B. Listing and Labeling: Provide fixtures and emergency lighting units that are listed and labeled for their indicated use on the Project.
  - 1. Special Listing and Labeling: Provide fixtures for use in damp or wet locations, underwater, and recessed in combustible construction specifically listed and



- labeled for such use. Provide fixtures for use in hazardous (classified) locations that are listed and labeled for the specific hazard.
2. The terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
  3. Listing and Labeling Agency Qualification: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- C. Manufacturers Qualifications: Firms experienced in manufacturing fixtures that are similar to those indicated for this Project and that have a record of successful in service performance.
- D. Coordination of Fixtures with Ceiling: Coordinate fixtures mounting hardware and trim with the ceiling system.

#### 1.4 EXTRA MATERIALS

- A. Furnish extra materials matching products installed, as described below, packaged with protective covering for storage, and identified with labels describing contents. Deliver extra materials to the Owner.
1. Diffusers and Lenses: 1 for each 50 of each type and rating installed. Furnish at least 1 of each type.
  2. Globes and Guards: 1 for each 20 of each type and rating installed. Furnish at least 1 of each type.

### PART 2 - PRODUCTS

#### 2.1 FIXTURES, GENERAL

- A. Comply with the requirements specified in the Articles below.

#### 2.2 FIXTURE COMPONENTS, GENERAL

- A. Metal Parts: Free from burrs and sharp corners and edges.
- B. Sheet Metal Components: Steel. Components are formed and supported to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under operating conditions. Arrange to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in the operating position.
- D. Reflecting Surfaces: Minimum reflectances as follows:

1. White Surfaces: 85 percent.
  2. Specular Surfaces: 83 percent.
  3. Diffusing Specular Surfaces: 75 percent.
  4. Laminated Silver Metallized Film: 90 percent.
- E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or water white, annealed crystal glass.
1. Plastic: Highly resistance to yellowing and other changes due to aging, exposure to heat and UV radiation.
  2. Lens Thickness: 0.125 inches, minimum.

### 2.3 SUSPENDED FIXTURE SUPPORT COMPONENTS

- A. Single Stem Hangers: 1/2 inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.
- B. Twin Stem Hangers: Two, 1/2 inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
- C. Rod Hangers: 3/16 inch diameter cadmium plated, threaded steel rod.
- D. Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking type plug.

### 2.4 LED FIXTURES

- A. Fixtures: Shall be UL Listed, Energy Star Qualified or Design Lights Consortium (DLC) rated.
- B. Ballasts: High efficiency electronic LED drivers.
- C. Lumen output and color temperature as per luminaire schedule.
- D. LEDs (light emitting diodes) shall have a 50,000 hour rated life.

### 2.5 EXIT SIGNS

- A. Conform to UL 924, "Emergency Lighting and Power Equipment," and the following:
1. Sign Colors: Conform to local code.
  2. Minimum Height of Letters: Conform to local code.
  3. Arrows: Chevron type per NFPA 101. Include as indicated.
  4. Lamps: LED.

- B. Self-Powered Exit Signs (Battery Type): Integral automatic high/low trickle charger in a self-contained power pack.
  - 1. Battery: Sealed, maintenance-free, lead calcium or nickel cadmium (as called for per luminaire schedule) rated for minimum of 90-minute fixture operation.

## **2.6 EMERGENCY LIGHTING**

- A. Emergency LED Drivers: Conform to UL 924 'Emergency Lighting and Power Equipment' and UL 1310, 'Class 2 Power Units' with the following features and additional characteristics as indicated.
  - 1. Battery: Sealed, maintenance-free, lead-calcium / nickel cadmium with 7 to 10-year nominal life minimum with five year warranty.
  - 2. Charger: Line-latching, fully automatic, solid state voltage limited.
  - 3. Features: Low voltage disconnect, brownout circuit, overload/short circuit protection, test switch and power indicator light.
- B. Remote Heads: Fully adjustable dual head (unless otherwise indicated) weatherproof with 5.4 watt Halogen sealed beam lamps.

## **2.7 FINISHES**

- A. Steel Parts: Manufacturer's standard finish applied over corrosion resistant primer, free of streaks, runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during project warranty period and replace with new fixtures.
- B. Other Parts: Manufacturer's standard finish.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's printed instructions and approved shop drawings.
- B. Support For Recessed and Semi-recessed Fixtures: Install units may be supported from suspended ceiling support system. Install ceiling system support rods or wires at a minimum of four rods or wires per fixture located not more than 6 inches from fixture corners.
  - 1. Fixtures Smaller Than Ceiling Grid: Install a minimum of four rods or wires for each fixture and locate at corner of the ceiling grid where the fixture is located. Do not support fixtures by ceiling acoustical panels.

2. Fixtures of Sizes Less Than Ceiling Grid: Center in the acoustical panel. Support fixtures independently with at least two 3/4 inch metal channels spanning and secured to the ceiling tees.
  3. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corners.
- C. Support for Suspended Fixtures: Brace pendants and rods that are 4 feet long or longer to limit swinging. Support stem mounted single unit suspended fluorescent fixtures with twin stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.

### 3.2 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Give advance notice of dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Tests: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include the following in tests of emergency lighting equipment.
  1. Duration of supply.
  2. Low battery voltage shut down.
  3. Normal transfer to battery source and retransfer to normal.
  4. Low supply voltage transfer.
- E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

### 3.3 ADJUSTING AND CLEANING

- A. Clean fixtures upon completion of installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 16515

**SECTION 16621 – LP GAS GENERATORS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. All of the Contract Documents, including General and Supplementary Conditions Bidding Documents, Contract Forms and Conditions of the Contract and Division 1 - General Requirements, apply to the work of this Section.
- B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all specifications sections and other Contract Documents.

**1.2 SUMMARY**

- A. Extent of generator set work is indicated by drawings and is hereby defined to include, but not by way of limitation, engine, electrical generator, engine starting system including batteries, instrument control panel, transfer switches, annunciator panel, remote annunciator panel, exhaust silencer, wall thimble, and accessories.
- B. Refer to other Division 16 sections for wires/cables, electrical boxes and fittings, and wiring devices, which are required in conjunction with engine generator work; not work of this section.

**1.3 SUBMITTALS**

- A. Product Data: Submit manufacturer's data on engine driven generator sets and components. Include manufacturer's standard product warranty, for duration of not less than one year, for replacement of materials and equipment used in diesel generator systems.
- B. Shop Drawings: Submit layout drawings of natural gas engine driven generator units and accessories including, but not limited to, automatic transfer switches, fuel line piping, remote start stop stations, and instrumentation. In addition, show generator set units and their spatial relationship to associated equipment. Allow adequate clearance space for removal of engine generator elements for maintenance purposes.
- C. Wiring Diagrams: Submit wiring diagrams for natural gas engine driven generator unit showing connections to electrical power panels, feeders, automatic transfer switches, and ancillary equipment. Differentiate between portions of wiring that are manufacturer installed and portions that are field installed.
- D. Agreement to Maintain: Prior to time of final acceptance, the Installer shall submit 4 copies of an agreement for continued service and maintenance of natural gas fired engine driven generator sets, for Owner's possible acceptance. Offer terms and conditions for furnishing parts and providing continued testing and servicing,

including replacement of materials and equipment, for one year period with option for renewal of Agreement by Owner.

- E. Certifications: Provide engine drive generator sets certified test record of the following final production testing:
  - 1. Single step load pickup.
  - 2. Transient and steady state governing.
  - 3. Safety shutdown device testing.
  - 4. Voltage regulation.
  - 5. Rated power.
  - 6. Maximum power.
- F. Provide certified test record prior to engine driven generator set being shipped from factory to project location.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of natural gas fired engine driven generator units and ancillary equipment, of types, ratings and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with engine driven generator units similar to that required for this project.
  - 1. Agreement to Maintain: Engage Installer who is willing to execute with the Owner, required agreement for continued maintenance of engine driven generator units. Service shall be available on a 24 hour, 7 day a week basis.
- C. Codes and Standards:
  - 1. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC Articles 517, 700, 701, and 702 pertaining to construction and installation of emergency and standby systems.
  - 2. NFPA Compliance: Comply with applicable requirements of NFPA 37, "Installation and Use of Stationary Combustion Engines and Gas Turbines," NFPA 99, "Standard for Health Care Facilities," and NFPA 101, "Code for Safety to Life from Fire in Buildings and Structures."
  - 3. UL Compliance: Comply with applicable requirements of UL 1008, "Automatic Transfer Switches," UL 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors," and UL 486B, "Wire Connectors for Use with Aluminum Conductors."
  - 4. ANSI/NEMA Compliance: Comply with applicable requirements of ANSI/NEMA MG 1, "Motors and Generators," and MG 2, "Safety and Use of Electric Motors and Generators."

- D. NEMA Compliance: Comply with applicable requirements of NEMA's Std's Pub No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)."
- E. IEEE Compliance: Comply with applicable portions of IEEE Std 446, "IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications."

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver engine driven generators properly packaged and mounted on pallets, or skids to facilitate handling of heavy items. Utilize factory fabricated type containers or wrappings for engine generator and components, which protect equipment from damage.
- B. Store engine driven generator equipment in original packaging and protect from weather and construction traffic. Wherever possible, store indoors, where necessary to store outdoors, store above grade and enclose with watertight wrapping.
- C. Handle engine driven generator equipment carefully to prevent physical damage to equipment and components. Do not install damaged equipment; remove from site and replace damaged equipment with new.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, provide generator sets from one of the following manufacturers:
  - 1. Atlantic Detroit Diesel Allison
  - 2. Caterpillar
  - 3. Cummins
  - 4. Kohler Co.
- B. LP Gas Generator Sets:
  - 1. General: Except as otherwise indicated, provide manufacturer's standard engine driven generator set and auxiliary equipment as indicated by published product information, and as required for a complete installation.
  - 2. LP Gas Engine Driven Generator: Provide packaged electrical power to LP gas engine driven generator assembly unit as indicated on drawings at a governed speed of 1800 RPM, and rated 1.0 power factor for continuous operation, 120/240 volt, 1 phase, 3 wire, 60 Hz, at 85 deg. F (29 deg. C). Equip generator with 4-cycle, 6 or 8 cylinder, 1800 RPM, LP gas engine as indicated, and fueled with LP gas.. Provide unit mounted radiator, blower fan, water pump, thermostat, and radiator duct flange capable of cooling engine with up to 0.5 inches water static pressure on fan. Connect engine drive directly to 4 pole

revolving field type single, maintenance free, bearing generator through semi flexible steel disk coupling; equip set with associated control equipment to automatically start engine, transfer load to standby power upon failure of normal power source, transfer load back to normal power upon its restoration, and stop engine. Cushion mount engine generator on heavy steel base with vibration isolators to reduce possibility of torsional vibration. Provide water cooled type engine with unit-mounted radiator. Equip engine with low oil pressure, high water temperature, and automatic over-speed safety shutdown devices. Equip generator with exciter and voltage regulator to maintain voltage within 2 percent of rated value. Direct connect generator to fly wheel by semi flexible steel disk coupling. Provide unit capable of voltage recovery, within regulated range, of 7 seconds following sudden load increase from 0 to 100 percent of rated load, and with voltage dip not to exceed 20 percent upon application of rated load at rated power factor. Construct unit in compliance with applicable standards and with additional construction features as indicated:

- a. Starting System: Provide engine generator unit with 24 volt, 3 wire, negative ground, starting system including 24 volt positive engagement solenoid shift starting motor, batteries and 70 ampere, or greater, automatic battery charging alternator with solid state voltage regulation.
- b. Instrument Control Panel: Provide engine generator unit with engine oil pressure and water temperature indicators, visual indication of fuel being utilized, battery charge rate ammeter, START STOP switch for manual operation of unit, reset circuit breaker, static voltage regulator, voltage adjusting rheostat, voltmeter, ammeter with phase selector switch with an OFF position, and with running time indicator and frequency meters. Select type circuitry of plug in design capable of quick replacement, and of accepting a plug in device, which allows maintenance to test control panel performance without operating the engine.

## 2.2 ENGINE-GENERATOR SET ACCESSORIES

- A. Provide factory fabricated wall mounted (or otherwise indicated) automatic load transfer switch control, of type and capacities indicated, to automatically start alternate generator unit when line voltage drops to 70 percent normal value, transfer load to generator, and transfer load back to normal source when voltage is restored to 90 percent normal. Equip electrically operated, mechanically held, and electrically and mechanically interlocked, transfer switch with limiter, which open starting circuit after 45 seconds when engine fails to start. Also provide time delay features to prevent excessive transfer and retransfer operation during momentary line voltage dips, load retransfer, and engine shutdown. Equip unit with trickle charger, and with indicator for starting battery, test switch for manual simulation of power outages including standby unit operation and load transfer, and time clock exerciser circuit for automatic periodic exercise of engine generator unit. Provide enclosure with door locks. Coat enclosure with manufacturer's standard color acrylic enamel finish over a corrosion resistive primer. Withstand current rating shall be 50 KA RMS SYM.



- B. Provide annunciator panels with visual and audible alarms to monitor and warn of emergency operating conditions affecting line and generator power sources.
- C. Provide insulated exhaust silencers with drain and piping as recommended by generator set manufacturer.
- D. Provide anchor bolts of galvanized steel, of types and sizes recommended by generator manufacturer.
  - 1. Furnish anchor bolts to concrete formwork. Install with installation drawings and instructions.
- E. Provide rust-resistant weather-protective sound reducing housing for generator unit made of heavy gage reinforced steel; mate and match to the unit enclosed, which permits proper cooling and access to both controller and service points. Housing to be provided with keyed locks. Sound attenuation features are to be provided with characteristics as noted on drawings.
- F. Provide engine block heating as recommended by generator set manufacturer.
- G. Provide weatherproof GFCI duplex receptacle within generator enclosure. Provide associated wiring/conduit required for a complete and fully functional installation.
- H. Provide manual remote shut-off switch with NEMA 4X enclosure and lockable clear cover. Provide all associated wiring/conduit. Pilla Electrical Products model "ST120SN4XNM" with 'PILCLHCOV1' cover or approved equal. Refer to drawings for location.
- I. Provide 400W, 120V battery heater for each battery installed. Refer to generator box notes on drawings for further requirements.
- J. Provide Float/Equalize battery charger with ammeter and voltmeter. Equip battery charger with alarm board circuitry for low battery voltage, high battery voltage and charger malfunction contacts. Battery charger shall contain, AC input and DC output fusing, DC voltage regulation, circuitry protection and NEMA enclosure.

### 2.3 ENGINE INSTRUMENTS

- A. The following engine instruments shall be included in the generator control panel.
  - 1. Lube oil pressure
  - 2. Water temperature
  - 3. D.C. ammeter
  - 4. Runtime

### 2.4 EXHAUST SYSTEMS

- A. An exhaust silencer suitable for critical type silencing (complete with condensate drains) shall be supplied of the size recommended by the generator set manufacturer. An octane band center frequency in Hertz data sheet accompany all muffler shop drawings. Silencer to include side inlet and companion flanges, bolts, nuts & gaskets.
- B. A section of seamless, flexible stainless steel exhaust piping of size and type recommended by the generator set manufacturer.

## 2.5 FUEL SYSTEM

- A. Fueling system for engine shall be LP gas. Provide LP gas regulator and/or booster as required to supply the appropriate fuel pressure required for optimum engine performance. Provide an energized to run shut off solenoid, fuel filter and gas regulator as a complete gas fuel train package. Provide stainless steel flexible connectors between the engine and fuel train.

## 2.6 ENGINE GENERATOR CONTROL PANEL

- A. (Unit mounted) The engine generator set shall include an oversized terminal box and combination engine generator control panel, shock mounted at the generator end of the unit. This unit-mounted panel shall include (but not limited to) the following:
  - 1. AC voltage regulator
  - 2. Voltage adjustment rheostat, +5%
  - 3. Start-stop switch
  - 4. AC voltmeter, 3-1/2" face, 2% accuracy.
  - 5. AC ammeter with current transformer, 3-1/2" face, 2% accuracy.
  - 6. Combination YM-AM phase selector switch.
  - 7. Dial frequency meter (pointer type), 3-1/2" face, 2% accuracy.
  - 8. Running elapsed time meter, 3-1/2" face, 2% accuracy.
  - 9. Automatic start/stop control
- B. Safety shutdowns with indicating light with lamp test switch for:
  - 1. Emergency stop -red
  - 2. Low oil pressure-red shutdown, amber warning
  - 3. High engine temperature-red shutdown, amber warning
  - 4. Low coolant level-red shutdown
  - 5. Low coolant temperature – warning
  - 6. Overspeed,-red shutdown.
  - 7. Overcrank,-red shutdown.
  - 8. Low fuel pressure- warning
  - 9. Underfrequency- red.
- C. Selector switch - "off, auto, manual" with pilot light to flash when selector switch is in "off" position.

- D. Unit mounted manual reset line circuit breaker, 2 pole, thermal magnetic molded case type. Trip rated with shunt trip device, sized to prevent generator overload, connected to safety shutdown system, sized as shown on plans. (Furnish zero (0) sequence ground fault CT's two (2) set of auxiliary contacts for annunciation system specified herein). Circuit breaker to be rated at 50 KRMS SYM interrupt capacity respectively.
- E. Panel light and duplex receptacle GFI type, 120VAC.
- F. Two (2) 120 Volt DC fused louver circuits.
- G. The control shall be designed to start the engine upon closure of a remote contact, and shutdown the engine when the remote control is reopened. Typical 2 places.
- H. The control must be manually reset following any fault condition.
- I. Control power shall be from the engine start battery.

## 2.7 REMOTE ANNUNCIATOR PANEL

- A. The engine generator shall be supplied with flush mount remote annunciator panel with hinged stainless steel face plate, wired to annunciator panel with hinged stainless steel face plate, wired to annunciation terminal strip, to give remote indication of the following:
  - 1. Power on (green)
  - 2. Emergency generator operating (amber)
  - 3. Battery charger malfunction (red)
  - 4. Low water level (shut-down red)
  - 5. High jacket water temperature (warning amber)(shut-down red)
  - 6. Low water temperature (warning amber) (shutdown red)
  - 7. High lube oil temperature (warning amber) (shutdown red)
  - 8. Low oil pressure (warning amber) (shutdown-red)
  - 9. Overspeed (red)
  - 10. Overcrank (red)
  - 11. Alarm horn & silence switch
  - 12. Lamp test switch
  - 13. Emergency stop (red)
- B. Coordinate installation location with Owner/Architect.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions under which engine driven generator unit is to be installed and notify Contractor in writing of conditions detrimental to proper

completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

### **3.2 INSTALLATION OF LP GAS ENGINE DRIVEN GENERATOR SETS**

- A. Install engine driven generator unit as indicated, in accordance with the equipment manufacturer's written instructions, and with recognized industry practices, to ensure that engine generator units fulfill requirements. Comply with NFPA and NEMA standards pertaining to installation of engine generator sets and accessories.
- B. Coordinate with other work, including raceways, electrical boxes and fittings, piping and accessories, as necessary to interface installation of engine generator equipment work with other work.
- C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486 and the National Electrical Code.
- D. Install units on vibration isolators and comply with manufacturer's indicated method of installation.
- E. Connect fuel piping to generator equipment as indicated, and comply with manufacturer's installation instructions.
- F. Align shafts of engine and generator within tolerances recommended by engine generator unit manufacturer.

### **3.2 GROUNDING**

- A. Provide equipment grounding connections for engine driven generator units as indicated. Tighten connections to comply with tightening torques specified in UL Std 486 to assure permanent and effective grounding.

### **3.3 FIELD QUALITY CONTROL**

- A. Start up Testing:
  - 1. Engage local equipment manufacturer's representative to perform start up and building load tests upon completion of installation, with the Engineer in attendance; provide certified test record. Tests are to include the following:
    - a. Check fuel, lubricating oil, and antifreeze in liquid cooled models for conformity to the manufacturer's recommendations under environmental conditions present.
    - b. Test prior to cranking engine for proper operation, accessories that normally function while the set is in a standby mode. Accessories include: engine heaters, battery charger, generator strip heater, remote annunciator.

- c. Check, during start up test mode, for exhaust leaks, path of exhaust gases outside of enclosure, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line to line voltage and phase rotation.
  - d. Test, by means of simulated power outage, automatic start up by remote automatic starting, transfer of load, and automatic shut down. Prior to this test adjust, for proper system coordination, transfer switch timers. Monitor throughout the test, engine temperature, oil pressure, battery charge level, generator voltage, amperes, and frequency.
2. Upon completion of installation demonstrate capability and compliance of system with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting. Initial testing and retesting to be at no cost to Owner.

**B. Central Field Testing:**

1. Torsiograph Analysis and Test: The manufacturer of the generator set shall verify that the engine-generator set, as configured, is free from harmful torsional stresses. The analysis shall include correlation of empirical data from tests on a representative prototype. The empirical data must include spectrum analysis of the torsional transducer output within the operating speed range of the engine-generator set. Calculations based on engine and generator separately are not acceptable.
2. Temperature Rise Test: Complete thermal evaluation of a prototype generator rotor and stator must include actual measurement of internal generator and exciter temperatures by embedded detector method, and measurement of average temperature rise by resistance method. No position measured any place in the windings may exceed the temperature rise limits of NEMA for the particular type of insulation system used. Resistance method temperature rise data shall be confirmed by a full load test on the generator set prototype to include conducted and radiated heat from the engine.
3. Short Circuit Test: A test on a prototype generator set shall have demonstrated that the generator set is designed to withstand the mechanical forces associated with a short circuit condition. With the generator set operating at rated load and speed, the generator terminals must be short circuited on all three phases for a duration of 20 seconds. At the conclusion of this test, the generator set must be capable of full load operation.
4. Endurance Run Test: A minimum of five hundred (500) continuous hours of endurance testing with a representative generator set prototype operating as defined by the manufacturer's standby rating shall have been performed. Endurance testing shall be used to verify structural soundness and durability.
5. Maximum Power Test: With the prototype generator set at normal operating temperature and with all power consuming auxiliaries in place, the maximum power available at rated speed shall be determined with the governor set at its

- fuel stop. The generator set shall maintain this power for a minimum of two minutes.
6. Linear Vibration Test: A test for in-line motion of components occurring along a repeatable path shall meet the manufacturer's acceptance criteria.
  7. Cooling System Test: A cooling system test shall demonstrate the ability of the generator set cooling system to maintain normal operating temperature while operating at full rated load and power factor at the highest ambient temperature of the system rating. Cooling air requirements, radiator airflow, and maximum allowable restriction at radiator discharge, shall be verified by this test.
  8. Maximum Motor Starting KVA: Motor starting KVA shall be determined by test, based on a sustained RMS recovery voltage of at least 90% of no load voltage with the specified load KVA at near zero power factor applied to the generator set.
  9. Transient Response, Steady-State Speed Control, and Voltage Regulation: Prototype generator set tests shall demonstrate consistent performance as follows; stable voltage and frequency at all loads from no load to full rated load, consistent frequency band width with steady-state load, maximum voltage and frequency dip on load acceptance and rejection, and restoration to steady-state after sudden load changes. Transient response is a complete generator set (engine, generator, exciter, and regulator) performance criteria and cannot be established based on generator data alone.

### **3.4 ON-SITE ACCEPTANCE TEST**

- A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two-hour building load test, and a one step rated load pickup test in accordance with NFPA 110. In addition, provide test for sequence pick-up including building and fire pump loads.

### **3.5 PERSONNEL TRAINING**

- A. Operating Personnel Training: Train Owner's maintenance personnel in procedures for starting up, testing and operating engine driven generator sets. In addition, train Owner's maintenance personnel in periodic maintenance of batteries, annunciator and gauges.

### **3.6 COMMISSIONING**

- A. Provide the services of a factory-authorized service representative to demonstrate and train Owner's maintenance personnel as specified below.
  1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintaining of the system. Provide a minimum of 8 hours training.
  2. Schedule training with Owner's maintenance personnel at least seven days in advance.

3. Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, system operation and adjusting controls. Provide up to three visits to the site for this purpose.

**3.7 WARRANTY**

- A. Provide one (1) year manufacturer's warranty
- B. Warranty: Include coverage of generator system, automatic transfer switch, remote annunciator, fuel system controls, operating equipment and devices.
- C. Comply with requirements of General Conditions.
- D. Provide free maintenance to extend 12 month beyond date of Owner's acceptance.

**3.8 MAINTENANCE SERVICE**

- A. In addition to required maintenance and protection during construction, provide maintenance on entire work of this Section for a period of one year commencing on the date final approvals are received from governmental agencies having jurisdiction. Provide:
  1. Systematic examination, adjustment, and lubrication.
  2. Repair or replacement of parts as required, using only genuine standard parts as approved for original installation.

END OF SECTION 16621

## **SECTION 16721 - FIRE ALARM SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes fire alarm systems. It includes requirements for system components including the following:
  - 1. Manual stations.
  - 2. Smoke detectors.
  - 3. Horn/Strobe Light Combination Units.
  - 4. Visual alarm signals.
  - 5. Fire alarm control panel (FACP).
  - 6. Fire alarm annunciator panel (FAAP).

#### **1.2 DEFINITIONS**

- A. Alarm Initiating Device: A manual station, smoke detector, heat detector, or sprinkler water flow switch.
- B. Alarm Signal: Signifies a state of emergency requiring immediate action. Pertains to signals such as the operation of a manual station and the operation of a sprinkler system flow switch.
- C. Supervisory Signal: Indicates need for action regarding fire suppression or other protective system.
- D. Trouble Signal: Indicates that a fault, such as an open circuit on ground, has occurred in the system.

#### **1.3 SYSTEM DESCRIPTION**

- A. General: Addressable, microprocessor based type system with manual and automatic alarm initiation, analog addressable devices.
- B. Signal Transmission: Multiplex signal transmission dedicated to fire alarm service only.
- C. Audible Alarm Indication: By horns.
- D. Functional Description: Provide a complete fire alarm and detection system with the following functions and operating features:
  - 1. Priority of Signals: Automatic response functions shall be accomplished by the first zone/device initiated. Alarm functions resulting from the first initiation shall not be altered by subsequent alarms. An alarm signal shall be the highest priority. Supervisory or trouble signals shall have second- and third-level



- priority. Signals of a higher level priority shall take precedence over signals of lower priority even though the lower priority condition occurred first.  
Annunciate all alarm signals regardless of priority or order received.
2. Noninterfering: Provide zoned, powered, wired, and supervised system so a signal on one zone does not prevent the receipt of signals from any other zone. All zones shall be manually resettable from the FACP after the initiating device or devices have been restored to normal. Systems that require the use of batteries or battery backup for the programming function are not acceptable.
  3. Fire Alarm shall activate the entire premises with respect to alarm annunciation.

#### **1.4 SEQUENCE OF OPERATION**

- A. Initiation device of the fire alarms system shall be the following:
  1. Smoke and Heat Detectors
  2. Manual Pull Stations
  3. Duct Smoke Detectors
- B. Signal Initiation: The manual or automatic operation of an alarm initiating or supervisory operating device shall cause the FACP to transmit an appropriate signal.
- C. Transmission Central Station: Alarm signals shall be automatically routed in a listed and approved manner to a station service transmitter using listed and approved equipment. Final connections to the station service transmitters will be made under this Contract, and connections to the FACP shall be made under this Contract.
- D. Silencing at FACP: Switches shall provide capability for acknowledgment of alarm; supervisory, trouble, and other specified signals at the FACP; and capability to silence the local audible signal and light an LED (light emitting diode). Subsequent alarms shall cause the audible signal to sound again until silenced in turn by switch operation. Restoration to normal of alarm, supervisory, and trouble conditions shall extinguish the associated LED and cause the audible signal to sound again until the restoration is acknowledged by switch operation.
- E. Power Loss Indication: Sound trouble signal at the FACP upon loss of primary power at the FACP and the annunciator. Illuminate the emergency power light at both locations when the system is operating on an alternate power supply.
- F. Annunciation: Annunciate manual or automatic operation of any alarm or supervisory initiating device both on the FACP and on the annunciator indicating the location and type device.
- G. FACP Alphanumeric Display: Alphanumeric display.
- H. General Alarm: A system general alarm includes:

1. Indicating the general alarm condition at the FACP and the system annunciator.
2. Identifying the device that is the source of the alarm at the FACP and the system annunciator.
3. Initiating audible and visible alarm signals throughout the premises.
4. Initiating transmission of alarm signal to remote central station.

- I. Manual pull station and detection device operation initiates a general alarm.

#### **1.5 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract.
- B. Product data for fire alarm system components including dimensioned plans, sections, and elevations showing minimum clearances, installed features and devices, and list of materials and NRTL listing data.
- C. Wiring diagrams from manufacturer differentiating between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Include drawings indicating components for both field and factory panel wiring.
- D. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs. Description shall cover this specific project. Manufacturer's standard descriptions for generic systems are not acceptable.
- E. Calculations for battery capacity for both alarm and supervisory modes.
- F. Operation and maintenance data for inclusion in Operating and Maintenance Manual specified in Division 1 and in Division 16 Section "Basic Electrical Requirements." Operation and maintenance data shall cover each type of product, including all features and operating sequences, both automatic and manual. Provide spare parts data. Provide the name, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.
- G. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with the referenced standards.
- H. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make a simultaneous identical submission to the authority having jurisdiction. Include copies of annotated Contract Drawings as required to depict component locations to facilitate review. Upon receipt of comments from the

authority, submit a copy of the marked-up submittal for review. Make resubmissions to the authority if required to make clarifications or revisions to obtain approval.

#### **1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who is a factory-authorized service representative to perform the Work of this Section.
- B. Compliance with Local Requirements: Comply with the applicable building code, local ordinances, and regulations and the requirements of the authority having jurisdiction.
- C. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."
- D. NFPA Compliance: Provide fire alarm and detection systems conforming to the requirements of the following publications:
  - 1. NFPA 72, National Fire Alarm Code.
- E. UL Listing and Labeling: Provide system and components specified in this Section that are listed and labeled by UL.
- F. Nationally Recognized Testing Laboratory Listing and Labeling (NRTL): Provide system and components specified in this section that are listed and labeled by an NRTL. The term "NRTL" shall be as defined in OSHA Regulation 1910.7.
- G. FM Compliance: Provide fire alarm systems and components that are FM-approved.
- H. Single-Source Responsibility: Obtain fire alarm components from a single source who assumes responsibility for compatibility for system components furnished.

#### **1.7 MAINTENANCE SERVICE**

- A. Maintenance Service Contract: Provide maintenance of fire alarm systems and equipment for a period of 12 months commencing with Substantial Completion, using factory-authorized service representatives.
  - 1. Basic services: Systematic, routine maintenance visits on a monthly basis at times coordinated with the Owner. In addition, respond to service calls within 24 hours of notification of system trouble. Adjust and replace defective parts and components with original manufacturer's replacement parts, components, and supplies.
  - 2. Additional Services: Perform services within the above 12-month period not classified as routine maintenance or as warranty work when authorized in writing. Compensation for additional services must be agreed upon in writing prior to performing services.

3. Renewal of Maintenance Service Contract: No later than 60 days prior to the expiration of the maintenance services contract, deliver to the Owner a proposal to provide contract maintenance and repair services for an additional one-year term. Owner will be under no obligation to accept maintenance service contract renewal proposal.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Edwards System Technologies (E.S.T.)
  2. Farenhyt
  3. Notifier
  4. Siemens

### 2.2 MAIN FIRE ALARM CONTROL PANEL

- A. The specification is based on a Notifier Model 'FireWarden-50' (NFW50). The FACP shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system, including but not limited to: intelligent addressable detection devices, addressable modules, annunciators, and other system controlled devices.
- B. Operator Control
  1. Acknowledge Switch:
    - a. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.
    - b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
  2. Alarm Silence Switch:
    - a. Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

3. Alarm Activate (Drill) Switch:
  - a. The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
4. System Reset Switch:
  - a. Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
5. Lamp Test:
  - a. The Lamp Test switch shall activate all system LEDs and light each segment of the liquid crystal display.
- C. System Capacity and General Operation
  1. The control panel shall be capable of monitoring up to fifty intelligent/addressable devices.
  2. The system shall include two Form-C programmable relays which can be used for Alarm, Supervisory, and a fixed Trouble relay rated at a minimum of 2.0 amps @ 30 VDC and 0.5 amps @ 30 VAC. It shall also include four programmable Notification Appliance Circuits (NACs) capable of being wired as Class B (NFPA Style Y) or Class A (NFPA Style Z).
  3. The fire alarm control panel shall include an operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color-coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
  4. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel. The system shall be fully programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.
  5. The system shall allow the programming of any input to activate any output or group of outputs. Systems which have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or require a laptop personal computer are not considered suitable substitutes.
  6. The FACP shall provide the following features:
    - a. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
    - b. Detector sensitivity test, meeting requirements of NFPA 72.
    - c. The ability to display or print system reports.
    - d. Alarm verification
    - e. Rapid manual station reporting.

- f. Non-alarm points for general (non-fire) control.
  - g. Periodic detector test, conducted automatically by the software.
  - h. Walk test, with a check for two detectors set to same address.
  - i. delay and discharge timers, and an abort function.
- 7. The FACP shall be capable of coding notification circuits in march time (120 PPM), temporal (NFPA 72).
- C. Central Microprocessor
  - 1. The microprocessor shall be a state-of-the-art, high speed, 16 bit RISC device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.
  - 2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
  - 3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.
  - 4. A special program check function shall be provided to detect common operator errors.
  - 5. An auto-program (self-learn) function shall be provided to quickly install initial functions and make the system operational.
  - 6. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download. This program shall also have a verification utility which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in compliance with the NFPA 72 requirements for testing after system modification.
- D. Display
  - 1. The display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
  - 2. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.

3. The display shall contain an alphanumeric, text-type display and dedicated LEDs for the annunciation of AC POWER, FIRE ALARM, SUPERVISORY, TROUBLE, and ALARM SILENCED conditions.
4. The display keypad shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
5. The display shall include the following operator control switches: ACKNOWLEDGE/STEP, ALARM SILENCE, DRILL (alarm activate), and SYSTEM RESET.

**E. Signaling Line Circuits (SLC)**

1. The system shall include a SLC circuit. SLC circuit to accommodate all system devices. SLC interface shall provide power to and communicate with up to 50 intelligent devices. SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 wiring.
2. The CPU shall receive information from all intelligent detectors to be processed to determine whether normal, alarm or trouble conditions exist for each detector. The software shall automatically compensate for the accumulation of dust in each detector up to allowable limits. The information shall also be used for automatic detector testing and for the determination of detector maintenance conditions.
3. The detector software shall meet NFPA 72, requirements and be certified by UL as a calibrated sensitivity test instrument.

**F. Serial Interfaces**

1. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Electronic Data Processing (EDP) peripherals.
2. The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays.

**G. Digital Alarm Communicator Transmitter (DACT). The DACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.**

1. The DACT shall be an integral component of the fire alarm control panel requiring no interconnecting wiring or supervisory circuitry.
2. The DACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to two different telephone numbers.
3. The DACT shall be completely field programmable locally from the control panel keypad or remotely over a phone line using upload/download PC software.

4. The DACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.
  5. Communication shall include vital system status such as:
    - Independent Zone (Alarm, trouble, non-alarm, supervisory)
    - Independent Addressable Device Status
    - AC (Mains) Power Loss
    - Low Battery and Earth Fault
    - System Off Normal
    - 12 and 24-Hour Test Signal
    - Abnormal Test Signal (per UL requirements)
    - EIA-485 Communications Failure
    - Phone Line Failure
  6. The DACT shall support independent zone/point reporting when used in the Contact ID format. In this format, the DACT shall support the transmission of up to 198 addressable points with the system. This enables the central station to have exact details concerning the location of the fire for emergency response.
- H. Enclosures:
1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
  2. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be selected for either right or left hand hinging.
- I. Power Supply:
1. The main power supply for the fire alarm control panel shall provide 2.7 amps of available power for the control panel and peripheral devices.
  2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
  3. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger or may be used with an external battery and charger systems. Battery arrangement may be configured in the field.
  4. The main power supply shall continuously monitor all field wires for earth ground conditions.
  5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.
  6. The main power supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge.



- J. Field Charging Power Supply (FCPS): The FCPS shall be used for either a remote 24 volt DC power supply or used to power notification appliances.
1. The FCPS shall provide regulated 24 volt power. It shall include an integral charger.
  2. The FCPS shall include an attractive surface mount backbox.
  3. The field charging power supply shall include the ability to delay the AC fail relay per 1993 NFPA requirements.
  4. The FCPS include power limited circuitry, per 1995 UL standards.
- M. Specific System Operations
1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.
  2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 5 to 30 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
  3. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.
  4. Point Read: The system shall be able to display or print the following point status diagnostic functions:
    - a. Device status
    - b. Device type
    - c. Custom device label
    - d. View analog detector values
    - e. Device zone assignments
    - f. All program parameters
  5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.
  6. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 1000 events, 200 events shall be dedicated to alarm and the remaining events are general purpose. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety.

- The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.
7. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
  8. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.
  9. Software Zones: The FACP shall provide 990 software zones.
  10. The fire alarm control panel shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without returning to the panel to reset the system. Operation shall be as follows:
    - a. Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test, for 3 seconds.
    - b. Introducing a trouble into the initiating device shall activate the programmed outputs for 8 seconds.
    - c. Walk test shall be selectable on a per device/circuit basis. All devices and circuits which are not selected for walk test shall continue to provide fire protection and if an alarm is detected, will exit walk test and activate all programmed alarm functions.
    - d. All devices tested in walk test shall be recorded in the history buffer.
  11. Supervisory Operation
    - a. An alarm from a supervisory device shall cause the appropriate indication on the 80 character display, light a common supervisory LED, but will not cause the system to enter the trouble mode.
  12. Signal Silence Operation
    - a. The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.
  13. Non-Alarm Input Operation

- a. Any addressable initiating device in the system may be used as a non-alarm input to monitor normally-open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.

### **2.3 HORNS**

- A. All horns shall operate on field selectable output taps from 0.5 to 2.0 Watts.
  1. Horns shall produce a nominal sound output of 87 DBA at 10 feet (3m).
- B. Frequency response shall be a minimum of 400 HZ to 4000 HZ.
- C. The back of each horn shall be sealed to protect the horn cone from damage and dust.

### **2.4 STROBE LIGHTS**

- A. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:
  1. The maximum pulse duration shall be 2/10 of one second.
  2. Strobe intensity shall meet the requirements of UL 1971.
  3. The flash rate shall meet the requirements of UL 1971.

### **2.5 ALPHANUMERIC LCD TYPE ANNUNCIATOR**

- A. Alphanumeric LCD Type Annunciator
  1. The alphanumeric display annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
  2. The LCD annunciator shall display all alarm and trouble conditions in the system.
  3. An audible indication of alarm shall be integral to the alphanumeric display.
  4. The display shall be UL listed for fire alarm application.

### **2.6 COMPONENTS**

- A. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.
- B. Field Wiring Terminal Blocks
  1. For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for 18 to 12 AWG wire. Terminal blocks which are permanently fixed are not acceptable.

### **2.7 SYSTEM COMPONENTS - ADDRESSABLE DEVICES**

- A. Addressable Devices - General
  1. Addressable devices shall use simple to install and maintain decade (numbered 1 to 10) type address switches.

2. Addressable devices which use a binary address setting method, such as a Dip switch, are difficult to install and subject to installation error. This type of device is not acceptable.
3. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel signaling line circuits.
4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
5. Smoke detector sensitivity shall be set in the fire alarm control panel and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.
7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.
8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
11. A magnetic test switch shall be provided to test each detector for 100% obscuration, reported to the FACP.
12. Addressable devices shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. LED(s) shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.

13. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
- B. Addressable Pull Box (manual station)
  1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
  2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
  3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.
  4. Stations shall be suitable for surface mounting or semiflush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.
- C. Intelligent Photoelectric Smoke Detector
  1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- D. Intelligent Ionization Smoke Detector
  1. The detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.
- E. Intelligent Thermal Detectors
  1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees fahrenheit (58 degrees Celsius). It shall connect via two wires to the fire alarm control panel signaling line circuit.
  2. The detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.
- F. Intelligent Duct Smoke Detector
  1. The in-duct smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
  2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the

rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

**G. Addressable Dry Contact Monitor Module**

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLC loops.
2. The monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box.
3. The IDC zone may be wired for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch x 1-1/4 inch x 1/2 inch. This version need not include Style D or an LED.

**H. Addressable Control Module**

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.
2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. The control module NAC shall be wired for Style Z (Class A) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.
5. The control module shall be suitable for pilot duty applications and rated for a minimum of .6 amps at 30 VDC.

**I. Isolator Module**

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building.

2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

## **2.8 PANEL BACK-UP POWER**

- A. The batteries shall be sealed, 24 volt nominal.
- B. The battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
- C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.
- D. If necessary to meet standby requirements, external battery and charger systems may be used.

## **2.9 CONDUIT AND WIRE**

- A. Conduit:
  1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
  2. Wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
  3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.
  4. Wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
  5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
  6. Conduit shall be 1/2 inch (19.1 mm) minimum.

7. Contractor may utilize fire alarm MC Cable in lieu of conduit when installing in concealed spaces.
- B. Wire:
  1. Fire alarm system wiring shall be part of this contract.
  2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.63 mm) for notification appliance circuits.
  3. High voltage and low voltage circuits: Solid copper conductors with 600 V THHN insulation (min. # 12 AWG).
  4. SLC Loop: 14 gauge, 1 pair, twisted shield cable.

#### 2.10 AUDIO-VISUAL INDICATING DEVICES

- A. Horn/Strobe Combination units shall contain UL 1971/ADA approved strobes which consist of a Xenon flash tube and solid state circuitry enclosed in a translucent white polycarbonate lens with the word FIRE inscribed on the lens in red. The audio portion of the unit shall have minimum sound output rating of 87 dBA at 10 feet. The speaker/strobe combination units shall mount recessed in 4-inch square, 2-1/8" deep electrical box.

### PART 3- EXECUTION

#### 3.1 INSTALLATION

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Where conduit cannot be concealed in finished areas, Contractor shall utilize surface raceway (wiremold) in lieu of conduit. Detection devices shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect detection devices from contamination and physical damage.
- C. All fire alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas. Devices may be surface mounted in finished areas when existing wall construction prohibits recessed installation.

#### 3.2 EQUIPMENT INSTALLATION



- A. Manual Pull Stations: Mount semi-flush in back boxes with operating handles 42" above finished floor.
- B. Audio-Visual Indicating Devices: Unless otherwise indicated, install horn on flush mounted back boxes with the device operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.
- C. Visual Indicating Devices: Install at 7'-6" above finished floor.
- E. Fire Alarm Control Panel (FACP): Surface mount with tops of cabinets not more than 6 ft. above the finished floor.
- F. Remote Annunciator: Top of the panel no more than 6 ft. above the finished floor.

### 3.3 WIRING INSTALLATION

- A. Wiring Method: Install wiring in Electrical Metallic Tubing (EMT) w/steel compression fittings in accordance with Division 16 Section "Raceways." Conceal raceway except in unfinished spaces.
- B. Wiring Within Enclosures: Install conductors parallel with or at right angles to the sides and back of the enclosure. Bundle, lace, and train the conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- C. Cable Taps: Use numbered terminal strips in junction, pull or outlet boxes, cabinets, or equipment enclosures where any circuit tap is made.
- D. Alarm Wiring: For the low-voltage portion of the fire alarm system, install No. 14 AWG conductors and 90-deg C insulation. Provide wiring operating at line voltage as minimum No. 12 AWG size having similar insulation.
- E. Color Coding: Color code fire alarm indicating circuit conductors differently from the normal building power wiring. Paint fire alarm system junction boxes and covers red.

### 3.4 GROUNDING

- A. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

### 3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
- C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable. The letter shall include the names and titles of the witnesses to the preliminary tests.
- D. Final Test Notice: Provide 10 days' minimum notice in writing when the system is ready for final acceptance testing.
- E. Minimum System Tests: Test the system in accordance with the procedures outlined in NFPA 72. Minimum required tests are as follows:
  - 1 Verify the absence of unwanted voltages between circuit conductors and ground.
  - 2 Megger test all conductors other than those intentionally and permanently grounded with electronic components disconnected. Test for resistance to ground. Report readings less than 1-megohm for evaluation.
  - 3 Test all conductors for short circuits utilizing an insulation testing device.
  - 4 With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on the record drawings.
  - 5 Verify the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
  - 6 Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of the initiating and indicating devices. Proper signal transmission in accordance with class of wiring used shall be observed.
  - 7 Test each initiating and indicating device for alarm operating and proper response at the control unit. Test smoke detectors with actual products of combustion.
  - 8 Test the system for all specified functions in accordance with the manufacturer's operating and maintenance manual. Systematically initiate specified functional performance items at each station including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences.

- Observe indicating lights, displays, and annunciator indications.
9. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the period and in the manner specified.
  10. Verify operation of speaker/fire telephone system. Verify operation of each channel as required.
  11. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
  12. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
  13. Open initiating device circuits and verify that the trouble signal actuates.
  14. Open and short signaling line circuits and verify that the trouble signal actuates.
  15. Open and short notification appliance circuits and verify that trouble signal actuates.
  16. Ground all circuits and verify response of trouble signals.
  17. Check presence and audibility of tone at all alarm notification devices.
  18. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
  19. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
  20. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.
- E. Retesting: Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- F. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log upon the satisfactory completion of tests.
- G. Tag all equipment and stations and other components at which tests have been satisfactorily completed. Place tags upon completion of tests.

### **3.6 COMMISSIONING**

- A. Provide the services of a factory-authorized service representative to demonstrate and train Owner's maintenance personnel as specified below.

1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.
2. Schedule training with the Owner at least seven days in advance.
3. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

### **3.7 INSTRUCTIONS**

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation" to the owner.

END OF SECTION 16721

**PREVAILING WAGE DOCUMENTS  
(RATES TO BE INSERTED PRIOR TO BID)**

Project: New Voluntown Public Works Garage

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**Minimum Rates and Classifications  
for Building Construction**

**ID# :** B 24594

**Connecticut Department of Labor  
Wage and Workplace Standards Division**

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By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his/her hourly wages.

**Project Number:**

**Project Town:** Voluntown

**State#:**

**FAP#:**

**Project:** New Voluntown Public Works Garage

| <b>CLASSIFICATION</b>  | <b>Hourly Rate</b> | <b>Benefits</b> |
|--|--------------------|-----------------|
| 1a) Asbestos Worker/Insulator (Includes application of insulating materials, protective coverings, coatings, & finishes to all types of mechanical systems; application of firestopping material for wall openings & penetrations in walls, floors, ceilings | 38.25              | 27.96           |
| 1b) Asbestos/Toxic Waste Removal Laborers: Asbestos removal and encapsulation (except its removal from mechanical systems which are not to be scrapped), toxic waste removers, blasters.**See Laborers Group 7**   |                    |                 |
| 1c) Asbestos Worker/Heat and Frost Insulator   | 39.00              | 28.76           |

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**As of: Thursday, March 29, 2018**

Project: New Voluntown Public Works Garage

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| 2) Boilermaker | 38.34 | 26.01 |
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| 3a) Bricklayer, Cement Mason, Concrete Finisher (including caulking),<br>Stone Masons | 33.48 | 32.06 + a |
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| 3b) Tile Setter | 34.90 | 25.87 |
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| 3c) Terrazzo Mechanics and Marble Setters | 31.69 | 22.35 |
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| 3d) Tile, Marble & Terrazzo Finishers | 26.70 | 21.75 |
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| 3e) Plasterer | 33.48 | 32.06 |
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***As of: Thursday, March 29, 2018***

Project: New Voluntown Public Works Garage

-----LABORERS-----

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| 4) Group 1: Laborers (common or general), acetylene burners, carpenter tenders, concrete specialists, wrecking laborers, fire watchers. | 29.25 | 19.50 |
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| 4a) Group 2: Mortar mixers, plaster tender, power buggy operators, powdermen, fireproofers/mixer/nozzlemans (Person running mixer and spraying fireproof only). | 29.50 | 19.50 |
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| 4b) Group 3: Jackhammer operators/pavement breaker, mason tender (brick), mason tender (cement/concrete), forklift operators and forklift operators (masonry). | 29.75 | 19.50 |
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| 4c) **Group 4: Pipelayers (Installation of water, storm drainage or sewage lines outside of the building line with P6, P7 license) (the pipelayer rate shall apply only to one or two employees of the total crew whose primary task is to actually perform the mating of pipe sections) P6 and P7 rate is \$26.80. | 29.75 | 19.50 |
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| 4d) Group 5: Air track operator, sand blaster and hydraulic drills. | 29.75 | 19.50 |
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Project: New Voluntown Public Works Garage

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| 4e) Group 6: Blasters, nuclear and toxic waste removal. | 31.00 | 19.50 |
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| 4f) Group 7: Asbestos/lead removal and encapsulation (except it's removal from mechanical systems which are not to be scrapped). | 30.25 | 19.50 |
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| 4g) Group 8: Bottom men on open air caisson, cylindrical work and boring crew. | 28.38 | 19.50 |
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| 4h) Group 9: Top men on open air caisson, cylindrical work and boring crew. | 27.86 | 19.50 |
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| 4i) Group 10: Traffic Control Signalman | 16.00 | 19.50 |
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| 5) Carpenter, Acoustical Ceiling Installation, Soft Floor/Carpet Laying, Metal Stud Installation, Form Work and Scaffold Building, Drywall Hanging, Modular-Furniture Systems Installers, Lathers, Piledrivers, Resilient Floor Layers. | 32.60 | 25.34 |
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**As of: Thursday, March 29, 2018**

Project: New Voluntown Public Works Garage

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| 5a) Millwrights | 33.14 | 25.74 |
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| 6) Electrical Worker (including low voltage wiring) (Trade License required: E1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9) | 39.15 | 25.17+3% of gross wage |
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| 7a) Elevator Mechanic (Trade License required: R-1,2,5,6) | 51.71 | 32.645+a+b |
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-----LINE CONSTRUCTION-----

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| Groundman | 26.50 | 6.5% + 9.00 |
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| Linemen/Cable Splicer | 48.19 | 6.5% + 22.00 |
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**As of: Thursday, March 29, 2018**

Project: New Voluntown Public Works Garage

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| 8) Glazier (Trade License required: FG-1,2) | 36.28 | 20.45 + a |
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| 9) Ironworker, Ornamental, Reinforcing, Structural, and Precast Concrete Erection | 35.47 | 33.39 + a |
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----OPERATORS----

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| Group 1: Crane handling or erecting structural steel or stone, hoisting engineer 2 drums or over, front end loader (7 cubic yards or over), work boat 26 ft. and over and Tunnel Boring Machines. (Trade License Required) | 39.30 | 24.05 + a |
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| Group 2: Cranes (100 ton rate capacity and over); Excavator over 2 cubic yards; Piledriver (\$3.00 premium when operator controls hammer); Bauer Drill/Caisson. (Trade License Required) | 38.98 | 24.05 + a |
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| Group 3: Excavator; Backhoe/Excavator under 2 cubic yards; Cranes (under 100 ton rated capacity), Grader/Blade; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar); Grader Operator; Bulldozer Fine Grade. (slopes, shaping, laser or GPS, etc.). (Trade License Required) | 38.24 | 24.05 + a |
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**As of: Thursday, March 29, 2018**

Project: New Voluntown Public Works Garage

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| Group 4: Trenching Machines; Lighter Derrick; Concrete Finishing Machine; CMI Machine or Similar; Koehring Loader (Skooper). | 37.85 | 24.05 + a |
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| Group 5: Specialty Railroad Equipment; Asphalt Paver; Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24" Mandrell) | 37.26 | 24.05 + a |
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| Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller; Pile Testing Machine. | 37.26 | 24.05 + a |
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| Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer). | 36.95 | 24.05 + a |
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| Group 7: Asphalt roller, concrete saws and cutters (ride on types), vermeer concrete cutter, Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24" and under Mandrell). | 36.61 | 24.05 + a |
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| Group 8: Mechanic, grease truck operator, hydroblaster; barrier mover; power stone spreader; welding; work boat under 26 ft.; transfer machine. | 36.21 | 24.05 + a |
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**As of: Thursday, March 29, 2018**

Project: New Voluntown Public Works Garage

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| Group 9: Front end loader (under 3 cubic yards), skid steer loader regardless of attachments, (Bobcat or Similar): forklift, power chipper; landscape equipment (including Hydroseeder). | 35.78 | 24.05 + a |
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| Group 10: Vibratory hammer; ice machine; diesel and air, hammer, etc. | 33.74 | 24.05 + a |
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| Group 11: Conveyor, earth roller, power pavement breaker (whiphammer), robot demolition equipment. | 33.74 | 24.05 + a |
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| Group 12: Wellpoint operator. | 33.68 | 24.05 + a |
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| Group 13: Compressor battery operator. | 33.10 | 24.05 + a |
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| Group 14: Elevator operator; tow motor operator (solid tire no rough terrain). | 31.96 | 24.05 + a |
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**As of: Thursday, March 29, 2018**

Project: New Voluntown Public Works Garage

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| Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator. | 31.55 | 24.05 + a |
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| Group 16: Maintenance Engineer/Oiler. | 30.90 | 24.05 + a |
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| Group 17: Portable asphalt plant operator; portable crusher plant operator; portable concrete plant operator. | 35.21 | 24.05 + a |
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| Group 18: Power safety boat; vacuum truck; zim mixer; sweeper; (Minimum for any job requiring a CDL license). | 32.79 | 24.05 + a |
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-----PAINTERS (Including Drywall Finishing)-----

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| 10a) Brush and Roller | 32.72 | 20.45 |
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**As of: Thursday, March 29, 2018**

Project: New Voluntown Public Works Garage

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| 10b) Taping Only/Drywall Finishing | 33.47 | 20.45 |
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| 10c) Paperhanger and Red Label | 33.22 | 20.45 |
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| 10e) Blast and Spray | 35.72 | 20.45 |
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| 11) Plumber (excluding HVAC pipe installation) (Trade License required:<br>P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2) | 41.62 | 30.36 |
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|                                       |       |           |
|---------------------------------------|-------|-----------|
| 12) Well Digger, Pile Testing Machine | 33.01 | 19.40 + a |
|---------------------------------------|-------|-----------|

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|                          |       |       |
|--------------------------|-------|-------|
| 13) Roofer (composition) | 35.67 | 19.28 |
|--------------------------|-------|-------|

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**As of: Thursday, March 29, 2018**

Project: New Voluntown Public Works Garage

|                           |       |       |
|---------------------------|-------|-------|
| 14) Roofer (slate & tile) | 36.17 | 19.28 |
|---------------------------|-------|-------|

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|  |       |       |
|--|-------|-------|
| 15) Sheetmetal Worker (Trade License required for HVAC and Ductwork:<br>SM-1,SM-2,SM-3,SM-4,SM-5,SM-6) | 37.18 | 34.29 |
|--|-------|-------|

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|   |       |       |
|---|-------|-------|
| 16) Pipefitter (Including HVAC work) (Trade<br>License required: S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4, G-1, G-2, G-8 &<br>G-9) | 41.62 | 30.36 |
|---|-------|-------|

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-----TRUCK DRIVERS-----

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|             |       |           |
|-------------|-------|-----------|
| 17a) 2 Axle | 29.13 | 22.32 + a |
|-------------|-------|-----------|

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|                               |       |           |
|-------------------------------|-------|-----------|
| 17b) 3 Axle, 2 Axle Ready Mix | 29.23 | 22.32 + a |
|-------------------------------|-------|-----------|

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As of: Thursday, March 29, 2018



Project: New Voluntown Public Works Garage

|                       |       |           |
|-----------------------|-------|-----------|
| 17c) 3 Axle Ready Mix | 29.28 | 22.32 + a |
|-----------------------|-------|-----------|

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|   |       |           |
|---|-------|-----------|
| 17d) 4 Axle, Heavy Duty Trailer up to 40 tons | 29.33 | 22.32 + a |
|---|-------|-----------|

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|                       |       |           |
|-----------------------|-------|-----------|
| 17e) 4 Axle Ready Mix | 29.38 | 22.32 + a |
|-----------------------|-------|-----------|

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|  |       |           |
|--|-------|-----------|
| 17f) Heavy Duty Trailer (40 Tons and Over) | 29.58 | 22.32 + a |
|--|-------|-----------|

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|  |       |           |
|--|-------|-----------|
| 17g) Specialized Earth Moving Equipment (Other Than Conventional Type on-the-Road Trucks and Semi-Trailers, Including Euclids) | 29.38 | 22.32 + a |
|--|-------|-----------|

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|  |       |           |
|--|-------|-----------|
| 18) Sprinkler Fitter (Trade License required: F-1,2,3,4) | 43.92 | 15.84 + a |
|--|-------|-----------|

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***As of: Thursday, March 29, 2018***

Project: New Voluntown Public Works Garage

|                                 |       |      |
|---------------------------------|-------|------|
| 19) Theatrical Stage Journeyman | 25.76 | 7.34 |
|---------------------------------|-------|------|



Project: New Voluntown Public Works Garage

*Welders: Rate for craft to which welding is incidental.*

*\*Note: Hazardous waste removal work receives additional \$1.25 per hour for truck drivers.*

*\*\*Note: Hazardous waste premium \$3.00 per hour over classified rate*

***ALL Cranes: When crane operator is operating equipment that requires a fully licensed crane operator to operate he receives an extra \$4.00 premium in addition to the hourly wage rate and benefit contributions:***

***1) Crane handling or erecting structural steel or stone; hoisting engineer (2 drums or over)***

***2) Cranes (100 ton rate capacity and over) Bauer Drill/Caisson***

***3) Cranes (under 100 ton rated capacity)***

Crane with 150 ft. boom (including jib) - \$1.50 extra

Crane with 200 ft. boom (including jib) - \$2.50 extra

Crane with 250 ft. boom (including jib) - \$5.00 extra

Crane with 300 ft. boom (including jib) - \$7.00 extra

Crane with 400 ft. boom (including jib) - \$10.00 extra

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work site ratio shall not be less than one full-time journeyman instructing and supervising the work of each apprentice in a specific trade.

*The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.*

*Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.*

*It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.*

*The annual adjustments will be posted on the Department of Labor's Web page: [www.ct.gov/dol](http://www.ct.gov/dol). For those without internet access, please contact the division listed below.*

*The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.*

*All subsequent annual adjustments will be posted on our Web Site for contractor access.*

*Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.*

**As of: Thursday, March 29, 2018**

Project: New Voluntown Public Works Garage

*Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage*

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

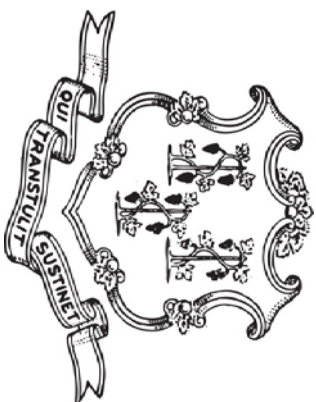
All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

**~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).**

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860)263-6790.

**As of: Thursday, March 29, 2018**



# **THIS IS A PUBLIC WORKS PROJECT**

**Covered by the**

## **PREVAILING WAGE LAW**

**CT General Statutes Section 31-53**

**If you have QUESTIONS regarding your wages**  
**CALL (860) 263-6790**

Section 31-55 of the CT State Statutes requires every contractor or subcontractor performing work for the state to post in a prominent place the prevailing wages as determined by the Labor Commissioner.

**Sec. 31-53b. Construction safety and health course. New miner training program. Proof of completion required for mechanics, laborers and workers on public works projects. Enforcement. Regulations. Exceptions.** (a) Each contract for a public works project entered into on or after July 1, 2009, by the state or any of its agents, or by any political subdivision of the state or any of its agents, described in subsection (g) of section 31-53, shall contain a provision requiring that each contractor furnish proof with the weekly certified payroll form for the first week each employee begins work on such project that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53 on such public works project, pursuant to such contract, has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, has completed a new miner training program approved by the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268.

(b) Any person required to complete a course or program under subsection (a) of this section who has not completed the course or program shall be subject to removal from the worksite if the person does not provide documentation of having completed such course or program by the fifteenth day after the date the person is found to be in noncompliance. The Labor Commissioner or said commissioner's designee shall enforce this section.

(c) Not later than January 1, 2009, the Labor Commissioner shall adopt regulations, in accordance with the provisions of chapter 54, to implement the provisions of subsections (a) and (b) of this section. Such regulations shall require that the ten-hour construction safety and health courses required under subsection (a) of this section be conducted in accordance with federal Occupational Safety and Health Administration Training Institute standards, or in accordance with Federal Mine Safety and Health Administration Standards or in accordance with 29 CFR 1910.268, as appropriate. The Labor Commissioner shall accept as sufficient proof of compliance with the provisions of subsection (a) or (b) of this section a student course completion card issued by the federal Occupational Safety and Health Administration Training Institute, or such other proof of compliance said commissioner deems appropriate, dated no earlier than five years before the commencement date of such public works project.

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

(P.A. 06-175, S. 1; P.A. 08-83, S. 1.)

History: P.A. 08-83 amended Subsec. (a) by making provisions applicable to public works project contracts entered into on or after July 1, 2009, replacing provision re total cost of work with reference to Sec. 31-53(g), requiring proof in certified payroll form that new mechanic, laborer or worker has completed a 10-hour or more construction safety course and adding provision re new miner training program, amended Subsec. (b) by substituting "person" for "employee" and adding "or program", amended Subsec. (c) by adding "or in accordance with Federal Mine Safety and Health Administration Standards" and setting new deadline of January 1, 2009, deleted former Subsec. (d) re "public building", added new Subsec. (d) re exemptions for public service company employees and delivery drivers who perform no labor other than delivery and made conforming and technical changes, effective January 1, 2009.

# **Informational Bulletin**

## **THE 10-HOUR OSHA CONSTRUCTION SAFETY AND HEALTH COURSE**

(applicable to public building contracts entered into *on or after July 1, 2007*, where the total cost of all work to be performed is at least \$100,000)

- (1) This requirement was created by Public Act No. 06-175, which is codified in Section 31-53b of the Connecticut General Statutes (pertaining to the prevailing wage statutes);
- (2) The course is required for public building construction contracts (projects funded in whole or in part by the state or any political subdivision of the state) entered into on or after July 1, 2007;
- (3) It is required of private employees (not state or municipal employees) and apprentices who perform manual labor for a general contractor or subcontractor on a public building project where the total cost of all work to be performed is at least \$100,000;
- (4) The ten-hour construction course pertains to the ten-hour Outreach Course conducted in accordance with federal OSHA Training Institute standards, and, for telecommunications workers, a ten-hour training course conducted in accordance with federal OSHA standard, 29 CFR 1910.268;
- (5) The internet website for the federal OSHA Training Institute is [http://www.osha.gov/fso/ote/training/edcenters/fact\\_sheet.html](http://www.osha.gov/fso/ote/training/edcenters/fact_sheet.html);
- (6) The statutory language leaves it to the contractor and its employees to determine who pays for the cost of the ten-hour Outreach Course;
- (7) Within 30 days of receiving a contract award, a general contractor must furnish proof to the Labor Commissioner that all employees and apprentices performing manual labor on the project will have completed such a course;
- (8) Proof of completion may be demonstrated through either: (a) the presentation of a *bona fide* student course completion card issued by the federal OSHA Training Institute; *or* (2) the presentation of documentation provided to an employee by a trainer certified by the Institute pending the actual issuance of the completion card;
- (9) Any card with an issuance date more than 5 years prior to the commencement date of the construction project shall not constitute proof of compliance;



- (10) Each employer shall affix a copy of the construction safety course completion card to the certified payroll submitted to the contracting agency in accordance with Conn. Gen. Stat. § 31-53(f) on which such employee's name first appears;
- (11) Any employee found to be in non-compliance shall be subject to removal from the worksite if such employee does not provide satisfactory proof of course completion to the Labor Commissioner by the fifteenth day after the date the employee is determined to be in noncompliance;
- (12) Any such employee who is determined to be in noncompliance may continue to work on a public building construction project for a maximum of fourteen consecutive calendar days while bringing his or her status into compliance;
- (13) The Labor Commissioner may make complaint to the prosecuting authorities regarding any employer or agent of the employer, or officer or agent of the corporation who files a false certified payroll with respect to the status of an employee who is performing manual labor on a public building construction project;
- (14) The statute provides the minimum standards required for the completion of a safety course by manual laborers on public construction contracts; any contractor can exceed these minimum requirements; and
- (15) Regulations clarifying the statute are currently in the regulatory process, and shall be posted on the CTDOL website as soon as they are adopted in final form.
- (16) Any questions regarding this statute may be directed to the Wage and Workplace Standards Division of the Connecticut Labor Department via the internet website of <http://www.ctdol.state.ct.us/wgwkstnd/wgemenu.htm>; or by telephone at (860)263-6790.

**THE ABOVE INFORMATION IS PROVIDED EXCLUSIVELY AS AN EDUCATIONAL RESOURCE, AND IS NOT INTENDED AS A SUBSTITUTE FOR LEGAL INTERPRETATIONS WHICH MAY ULTIMATELY ARISE CONCERNING THE CONSTRUCTION OF THE STATUTE OR THE REGULATIONS.**

November 29, 2006

**Notice**  
**To All Mason Contractors and Interested Parties**  
**Regarding Construction Pursuant to Section 31-53 of the**  
**Connecticut General Statutes (Prevailing Wage)**

The Connecticut Labor Department Wage and Workplace Standards Division is empowered to enforce the prevailing wage rates on projects covered by the above referenced statute.

Over the past few years the Division has withheld enforcement of the rate in effect for workers who operate a forklift on a prevailing wage rate project due to a potential jurisdictional dispute.

The rate listed in the schedules and in our Occupational Bulletin (see enclosed) has been as follows:

**Forklift Operator:**

- **Laborers (Group 4) Mason Tenders** - operates forklift solely to assist a mason to a maximum height of nine feet only.
- **Power Equipment Operator (Group 9)** - operates forklift to assist any trade and to assist a mason to a height over nine feet.

The U.S. Labor Department conducted a survey of rates in Connecticut but it has not been published and the rate in effect remains as outlined in the above Occupational Bulletin.

***Since this is a classification matter and not one of jurisdiction, effective January 1, 2007 the Connecticut Labor Department will enforce the rate on each schedule in accordance with our statutory authority.***

Your cooperation in filing appropriate and accurate certified payrolls is appreciated.

## STATUTE 31-55a

### - SPECIAL NOTICE -

**To: All State and Political Subdivisions, Their Agents, and Contractors**

**Connecticut General Statute 31-55a - Annual adjustments to wage rates by contractors doing state work.**

*Each contractor that is awarded a contract on or after October 1, 2002, for (1) the construction of a state highway or bridge that falls under the provisions of section 31-54 of the general statutes, or (2) the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project that falls under the provisions of section 31-53 of the general statutes shall contact the Labor Commissioner on or before July first of each year, for the duration of such contract, to ascertain the prevailing rate of wages on an hourly basis and the amount of payment or contributions paid or payable on behalf of each mechanic, laborer or worker employed upon the work contracted to be done, and shall make any necessary adjustments to such prevailing rate of wages and such payment or contributions paid or payable on behalf of each such employee, effective each July first.*

- The prevailing wage rates applicable to any contract or subcontract awarded on or after October 1, 2002 are subject to annual adjustments each July 1st for the duration of any project which was originally advertised for bids on or after October 1, 2002.
- Each contractor affected by the above requirement shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.
- It is the **contractor's** responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's Web Site. The annual adjustments will be posted on the Department of Labor Web page: [www.ctdol.state.ct.us](http://www.ctdol.state.ct.us). For those without internet access, please contact the division listed below.
- The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project. All subsequent annual adjustments will be posted on our Web Site for contractor access.


**Any questions should be directed to the Contract Compliance Unit, Wage and Workplace Standards Division, Connecticut Department of Labor, 200 Folly Brook Blvd., Wethersfield, CT 06109 at (860)263-6790.**

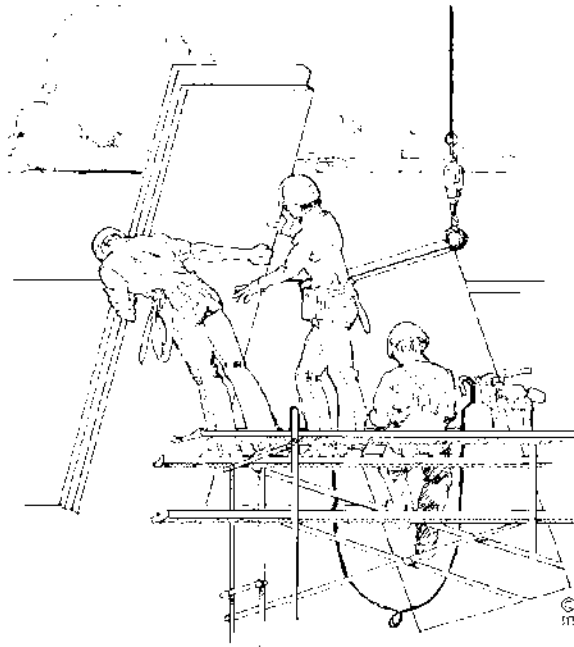
## ~NOTICE~

### TO ALL CONTRACTING AGENCIES

Please be advised that Connecticut General Statutes Section 31-53, requires the contracting agency to certify to the Department of Labor, the total dollar amount of work to be done in connection with such public works project, regardless of whether such project consists of one or more contracts.

Please find the attached “Contracting Agency Certification Form” to be completed and returned to the Department of Labor, Wage and Workplace Standards Division, Public Contract Compliance Unit.

 Inquiries can be directed to (860)263-6543.



CONNECTICUT DEPARTMENT OF LABOR  
WAGE AND WORKPLACE STANDARDS DIVISION  
CONTRACT COMPLIANCE UNIT

*CONTRACTING AGENCY CERTIFICATION FORM*

I, \_\_\_\_\_, acting in my official capacity as \_\_\_\_\_,  
authorized representative title

for \_\_\_\_\_, located at \_\_\_\_\_,  
contracting agency address

do hereby certify that the total dollar amount of work to be done in connection with

\_\_\_\_\_, located at \_\_\_\_\_,  
project name and number address

shall be \$\_\_\_\_\_, which includes all work, regardless of whether such project  
consists of one or more contracts.

*CONTRACTOR INFORMATION*

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Authorized Representative: \_\_\_\_\_

Approximate Starting Date: \_\_\_\_\_

Approximate Completion Date: \_\_\_\_\_

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Return To: Connecticut Department of Labor  
Wage & Workplace Standards Division  
Contract Compliance Unit  
200 Folly Brook Blvd.  
Wethersfield, CT 06109

Date Issued: \_\_\_\_\_

CONNECTICUT DEPARTMENT OF LABOR  
WAGE AND WORKPLACE STANDARDS DIVISION

**CONTRACTORS WAGE CERTIFICATION FORM**  
**Construction Manager at Risk/General Contractor/Prime Contractor**

I, \_\_\_\_\_ of \_\_\_\_\_  
Officer, Owner, Authorized Rep. Company Name

do hereby certify that the \_\_\_\_\_  
Company Name  
\_\_\_\_\_  
Street  
\_\_\_\_\_  
City

and all of its subcontractors will pay all workers on the

\_\_\_\_\_  
Project Name and Number  
\_\_\_\_\_  
Street and City

the wages as listed in the schedule of prevailing rates required for such project (a copy of which is attached hereto).

\_\_\_\_\_  
Signed

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
Notary Public

Return to:

Connecticut Department of Labor  
Wage & Workplace Standards Division  
200 Folly Brook Blvd.  
Wethersfield, CT 06109

*Rate Schedule Issued (Date):* \_\_\_\_\_



## CONNECTICUT DEPARTMENT OF LABOR

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In accordance with [Connecticut General Statutes, 31-53](#) Certified Payrolls with a statement of compliance shall be submitted monthly to the contracting agency.

**Note:** Once you have downloaded these forms and are ready to print them out, set the print function on your PC to the horizontal print orientation.

**Note2:** Please download both the Payroll Certification for Public Works Projects **and** the Certified Statement of Compliance for a complete package. The Certified Statement of Compliance appears on the same page as the Fringe Benefits Explanation page.

**Announcement: The Certified Payroll Form WWS-CPI can now be completed on-line!**

- [Certified Payroll Form WWS-CPI](#) (PDF, 727KB)
- [Sample Completed Form](#) (PDF, 101KB)

200 Folly Brook Boulevard, Wethersfield, CT 06109 / Phone: 860-263-6000

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[New] In accordance with Section 31-53b(a) of the C.G.S. each contractor shall provide a copy of the OSHA 10 Hour Construction Safety and Health Card for each employee, to be attached to the first certified payroll on the project.

|  |  |                     |                                 |  |  |                       |   |   |   |    |   |   |                         |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
|--|--|---------------------|---------------------------------|--|--|-----------------------|---|---|---|----|---|---|-------------------------|--|--|--------------------|------|--|---------------------------|--|------------------------|---|--|--------------------|--|--|--|--|--|
| In accordance with Connecticut General Statutes, 31-53<br>Certified Payrolls with a statement of compliance<br>shall be submitted monthly to the contracting agency. |  |                     |                                 |  |  |                       |   |   |   |    |   | PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS |                         |  |  |                    |      |  |                           |  |                        | Connecticut Department of Labor<br>Wage and Workplace Standards Division<br>200 Folly Brook Blvd.<br>Wethersfield, CT 06109 |  |                    |  |  |  |  |  |
| CONTRACTOR NAME AND ADDRESS:   |  |                     |                                 |  |  |                       |   |   |   |    |   | SUBCONTRACTOR NAME & ADDRESS                    |                         |  |  |                    |      | WORKER'S COMPENSATION INSURANCE CARRIER<br><br>POLICY #<br><br>EFFECTIVE DATE:<br>EXPIRATION DATE: |                           |  |                        |   |  |                    |  |  |  |  |  |
| PAYROLL NUMBER   |  | Week-Ending<br>Date |                                 | PROJECT NAME & ADDRESS   |  |                       |   |   |   |    |   |   |                         |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
| PERSON/WORKER,<br>ADDRESS and SECTION  |  | APPR<br>RATE<br>%   | MALE/<br>FEMALE<br>AND<br>RACE* | WORK<br>CLASSIFICATION   |  | DAY AND DATE          |   |   |   |    |   | Total ST<br>Hours                               | BASE HOURLY<br>RATE     | TYPE OF<br>FRINGE<br>BENEFITS<br>Per Hour<br>1 through 6<br>(see back) | GROSS PAY<br>FOR ALL<br>WORK<br>PERFORMED<br>THIS WEEK | TOTAL DEDUCTIONS   |      |  |                           | GROSS PAY FOR<br>THIS PREVAILING<br>RATE JOB | CHECK # AND<br>NET PAY |   |  |                    |  |  |  |  |  |
|  |  |                     |                                 |  |  | S                     | M | T | W | TH | F | S   |                         |  |  | Total<br>O/T Hours | FICA | FEDERAL<br>WITH-<br>HOLDING  | STATE<br>WITH-<br>HOLDING |  |                        | LIST<br>OTHER   |  |                    |  |  |  |  |  |
|  |  |                     |                                 | Trade License Type<br>& Number - OSHA<br>10 Certification Number |  | HOURS WORKED EACH DAY |   |   |   |    |   | TOTAL FRINGE<br>BENEFIT PLAN<br>CASH            |                         |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
|  |  |                     |                                 |  |  |                       |   |   |   |    |   | \$<br>Base Rate                                 | 1. \$<br>2. \$<br>3. \$ |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
|  |  |                     |                                 |  |  |                       |   |   |   |    |   | \$<br>Cash Fringe                               | 4. \$<br>5. \$<br>6. \$ |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
|  |  |                     |                                 |  |  |                       |   |   |   |    |   | \$<br>Base Rate                                 | 1. \$<br>2. \$<br>3. \$ |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
|  |  |                     |                                 |  |  |                       |   |   |   |    |   | \$<br>Cash Fringe                               | 4. \$<br>5. \$<br>6. \$ |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
|  |  |                     |                                 |  |  |                       |   |   |   |    |   | \$<br>Base Rate                                 | 1. \$<br>2. \$<br>3. \$ |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
|  |  |                     |                                 |  |  |                       |   |   |   |    |   | \$<br>Cash Fringe                               | 4. \$<br>5. \$<br>6. \$ |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
|  |  |                     |                                 |  |  |                       |   |   |   |    |   | \$<br>Base Rate                                 | 1. \$<br>2. \$<br>3. \$ |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
|  |  |                     |                                 |  |  |                       |   |   |   |    |   | \$<br>Cash Fringe                               | 4. \$<br>5. \$<br>6. \$ |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
| 12/9/2013  |  |                     |                                 |  |  |                       |   |   |   |    |   | *IF REQUIRED                                    |                         |  |  |                    |      |  |                           |  |                        |   |  |                    |  |  |  |  |  |
| WWS-CP1  |  |                     |                                 |  |  |                       |   |   |   |    |   | *SEE REVERSE SIDE                               |                         |  |  |                    |      |  |                           |  |                        |   |  | PAGE NUMBER ____OF |  |  |  |  |  |



**\*FRINGE BENEFITS EXPLANATION (P):**

Bona fide benefits paid to approved plans, funds or programs, except those required by Federal or State Law (unemployment tax, worker’s compensation, income taxes, etc.).

Please specify the type of benefits provided:

- 1) Medical or hospital care \_\_\_\_\_
- 4) Disability\_\_\_\_\_
- 2) Pension or retirement \_\_\_\_\_
- 5) Vacation, holiday\_\_\_\_\_
- 3) Life Insurance \_\_\_\_\_
- 6) Other (please specify) \_\_\_\_\_

**CERTIFIED STATEMENT OF COMPLIANCE**

For the week ending date of \_\_\_\_\_,

I, \_\_\_\_\_ of \_\_\_\_\_, (hereafter known as  
Employer) in my capacity as \_\_\_\_\_ (title) do hereby certify and state:

**Section A:**

1. All persons employed on said project have been paid the full weekly wages earned by them during the week in accordance with Connecticut General Statutes, section 31-53, as amended. Further, I hereby certify and state the following:

- a) The records submitted are true and accurate;
- b) The rate of wages paid to each mechanic, laborer or workman and the amount of payment or contributions paid or payable on behalf of each such person to any employee welfare fund, as defined in Connecticut General Statutes, section 31-53 (h), are not less than the prevailing rate of wages and the amount of payment or contributions paid or payable on behalf of each such person to any employee welfare fund, as determined by the Labor Commissioner pursuant to subsection Connecticut General Statutes, section 31-53 (d), and said wages and benefits are not less than those which may also be required by contract;
- c) The Employer has complied with all of the provisions in Connecticut General Statutes, section 31-53 (and Section 31-54 if applicable for state highway construction);
- d) Each such person is covered by a worker’s compensation insurance policy for the duration of his employment which proof of coverage has been provided to the contracting agency;
- e) The Employer does not receive kickbacks, which means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided directly or indirectly, to any prime contractor, prime contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a prime contractor in connection with a subcontractor relating to a prime contractor; and
- f) The Employer is aware that filing a certified payroll which he knows to be false is a class D felony for which the employer may be fined up to five thousand dollars, imprisoned for up to five years or both.

2. OSHA~The employer shall affix a copy of the construction safety course, program or training completion document to the certified payroll required to be submitted to the contracting agency for this project on which such persons name first appears.

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
Submitted on (Date)

|  |                   |                                 |  |   |   |   |   |    |   |                   |                     |  |   |   |  |  |  |  |                        |
|--|-------------------|---------------------------------|--|---|---|---|---|----|---|-------------------|---------------------|--|---|---|--|--|--|--|------------------------|
| Weekly Payroll Certification For<br>Public Works Projects (Continued)  |                   |                                 |  | PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS |   |   |   |    |   |                   |                     |  |   | Week-Ending Date:<br>Contractor or Subcontractor Business Name: |  |  |  |  |                        |
| WEEKLY PAYROLL   |                   |                                 |  |   |   |   |   |    |   |                   |                     |  |   |   |  |  |  |  |                        |
| PERSON/WORKER,<br>ADDRESS and SECTION                                  | APPR<br>RATE<br>% | MALE/<br>FEMALE<br>AND<br>RACE* | WORK<br>CLASSIFICATION   | DAY AND DATE                                    |   |   |   |    |   | Total ST<br>Hours | BASE HOURLY<br>RATE | TYPE OF<br>FRINGE<br>BENEFITS<br>Per Hour<br>1 through 6<br>(see back) | GROSS PAY<br>FOR ALL WORK<br>PERFORMED<br>THIS WEEK | TOTAL DEDUCTIONS  |  |  |  | GROSS PAY FOR<br>THIS PREVAILING<br>RATE JOB | CHECK # AND<br>NET PAY |
|  |                   |                                 |  | S   | M | T | W | TH | F | S                 |                     |  |   |   |  |  |  |  |                        |
|  |                   |                                 | Trade License Type<br>& Number - OSHA<br>10 Certification Number |   |   |   |   |    |   |                   | Total<br>O/T Hours  |  |   | TOTAL FRINGE<br>BENEFIT PLAN<br>CASH                            |  |  |  |  |                        |
|  |                   |                                 |  | HOURS WORKED EACH DAY                           |   |   |   |    |   |                   |                     |  |   |   |  |  |  |  |                        |
|  |                   |                                 |  |   |   |   |   |    |   |                   | \$<br>Base Rate     | 1. \$<br>2. \$<br>3. \$  |   |   |  |  |  |  |                        |
|  |                   |                                 |  |   |   |   |   |    |   |                   | \$<br>Cash Fringe   | 4. \$<br>5. \$<br>6. \$  |   |   |  |  |  |  |                        |
|  |                   |                                 |  |   |   |   |   |    |   |                   | \$<br>Base Rate     | 1. \$<br>2. \$<br>3. \$  |   |   |  |  |  |  |                        |
|  |                   |                                 |  |   |   |   |   |    |   |                   | \$<br>Cash Fringe   | 4. \$<br>5. \$<br>6. \$  |   |   |  |  |  |  |                        |
|  |                   |                                 |  |   |   |   |   |    |   |                   | \$<br>Base Rate     | 1. \$<br>2. \$<br>3. \$  |   |   |  |  |  |  |                        |
|  |                   |                                 |  |   |   |   |   |    |   |                   | \$<br>Cash Fringe   | 4. \$<br>5. \$<br>6. \$  |   |   |  |  |  |  |                        |
|  |                   |                                 |  |   |   |   |   |    |   |                   | \$<br>Base Rate     | 1. \$<br>2. \$<br>3. \$  |   |   |  |  |  |  |                        |
|  |                   |                                 |  |   |   |   |   |    |   |                   | \$<br>Cash Fringe   | 4. \$<br>5. \$<br>6. \$  |   |   |  |  |  |  |                        |
|  |                   |                                 |  |   |   |   |   |    |   |                   | \$<br>Base Rate     | 1. \$<br>2. \$<br>3. \$  |   |   |  |  |  |  |                        |
|  |                   |                                 |  |   |   |   |   |    |   |                   | \$<br>Cash Fringe   | 4. \$<br>5. \$<br>6. \$  |   |   |  |  |  |  |                        |
| *IF REQUIRED   |                   |                                 |  |   |   |   |   |    |   |                   |                     |  |   |   |  |  |  |  |                        |
| 12/9/2013<br>WWS-CP2   |                   |                                 |  |   |   |   |   |    |   |                   |                     |  |   |   |  |  |  |  |                        |
| NOTICE: THIS PAGE MUST BE ACCOMPANIED BY A COVER PAGE (FORM # WWS-CP1) |                   |                                 |  |   |   |   |   |    |   |                   |                     |  |   |   |  |  |  |  |                        |
| PAGE NUMBER ____ OF  |                   |                                 |  |   |   |   |   |    |   |                   |                     |  |   |   |  |  |  |  |                        |

[New] In accordance with Section 31-53b(a) of the C.G.S. each contractor shall provide a copy of the OSHA 10 Hour Construction Safety and Health Card for each employee, to be attached to the first certified payroll on the project.

| PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS  |                             |   |  |              |    |    |    |    |    |  |   | Connecticut Department of Labor<br>Wage and Workplace Standards Division<br>200 Folly Brook Blvd.<br>Wethersfield, CT 06109 |   |  |                  |                  |       |               |  |                        |
|--|-----------------------------|---|--|--------------|----|----|----|----|----|--|---|---|---|--|------------------|------------------|-------|---------------|--|------------------------|
| In accordance with Connecticut General Statutes, 31-53<br>Certified Payrolls with a statement of compliance<br>shall be submitted monthly to the contracting agency. |                             |   |  |              |    |    |    |    |    |  |   | WEEKLY PAYROLL  |   |  |                  |                  |       |               |  |                        |
| CONTRACTOR NAME AND ADDRESS:<br>Landon Corporation, 15 Connecticut Avenue, Northford, CT 06472   |                             |   |  |              |    |    |    |    |    | SUBCONTRACTOR NAME & ADDRESS<br>XYZ Corporation<br>2 Main Street<br>Yantic, CT 06389 |   |   | WORKER'S COMPENSATION INSURANCE CARRIER<br>Travelers Insurance Company<br>POLICY # #BAC8888928<br>EFFECTIVE DATE: 1/1/09<br>EXPIRATION DATE: 12/31/09 |  |                  |                  |       |               |  |                        |
| PAYROLL NUMBER<br>1  | Week-Ending Date<br>9/26/09 | PROJECT NAME & ADDRESS<br>DOT 105-296, Route 82 |  |              |    |    |    |    |    |  |   |   |   |  |                  |                  |       |               |  |                        |
| PERSON/WORKER,<br>ADDRESS and SECTION  | APPR<br>RATE<br>%           | MALE/<br>FEMALE<br>AND<br>RACE*                 | WORK<br>CLASSIFICATION<br><br>Trade License Type<br>& Number - OSHA<br>10 Certification Number | DAY AND DATE |    |    |    |    |    |  | Total ST<br>Hours<br><br>Total<br>O/T Hours | BASE HOURLY<br>RATE<br><br>TOTAL FRINGE<br>BENEFIT PLAN<br>CASH   | TYPE OF<br>FRINGE<br>BENEFITS<br>Per Hour<br>1 through 6<br>(see back)  | GROSS PAY<br>FOR ALL<br>WORK<br>PERFORMED<br>THIS WEEK | TOTAL DEDUCTIONS |                  |       |               | GROSS PAY FOR<br>THIS PREVAILING<br>RATE JOB | CHECK # AND<br>NET PAY |
|  |                             |   |  | S            | M  | T  | W  | TH | F  | S  |   |   |   |  | FICA             | FEDERAL          | STATE | LIST<br>OTHER |  |                        |
|  |                             |   |  | 20           | 21 | 22 | 23 | 24 | 25 | 26   |   |   |   |  | WITH-<br>HOLDING | WITH-<br>HOLDING |       |               |  |                        |
| Robert Craft<br>81 Maple Street<br>Willimantic, CT 06226   |                             | M/C   | Electrical Lineman<br>E-1 1234567<br>Owner<br>OSHA 123456                                      |              | 8  | 8  | 8  | 8  | 8  |  | S-TIME<br>40<br>O-TIME                      | \$ 30.75<br>Base Rate<br>\$ 8.82<br>Cash Fringe   | 1. \$ 5.80<br>2. \$<br>3. \$ 2.01<br>4. \$<br>5. \$<br>6. \$  | \$1,582.80   |                  |                  |       | P-xxxx        | \$1,582.80                                   | #123<br>\$ xxx.xx      |
| Ronald Jones<br>212 Elm Street<br>Norwich, CT 06360  | 65%                         | M/B   | Electrical<br>Apprentice<br><br>OSHA 234567  |              | 8  | 8  | 8  | 8  | 8  |  | S-TIME<br>40<br>O-TIME                      | \$ 19.99<br>Base Rate<br>\$ 16.63<br>Cash Fringe  | 1. \$<br>2. \$<br>3. \$<br>4. \$<br>5. \$<br>6. \$  | \$1,464.80   | xx.xx            | xxx.xx           | xx.xx | G-xxx         | \$1,464.80                                   | #124<br>\$xxx.xx       |
| Franklin T. Smith<br>234 Washington Rd.<br>New London, CT<br>06320<br>SECTION B  |                             | M/H   | Project Manager  |              |    | 8  |    |    |    |  | S-TIME<br>8<br>O-TIME                       | \$<br>Base Rate<br>\$<br>Cash Fringe  | 1. \$<br>2. \$<br>3. \$<br>4. \$<br>5. \$<br>6. \$  | \$1,500.00   | xx.xx            | xx.xx            | xx.xx | M-xx.x        |  | #125<br>xxx.xx         |
|  |                             |   |  |              |    |    |    |    |    |  | S-TIME<br>O-TIME                            | \$<br>Base Rate<br>\$<br>Cash Fringe  | 1. \$<br>2. \$<br>3. \$<br>4. \$<br>5. \$<br>6. \$  |  |                  |                  |       |               |  |                        |

7/13/2009  
WWS-CP1
\*IF REQUIRED
\*SEE REVERSE SIDE
PAGE NUMBER 1 OF 2

OSHA 10 ~ATTACH CARD TO 1ST CERTIFIED PAYROLL

**\*FRINGE BENEFITS EXPLANATION (P):**

Bona fide benefits paid to approved plans, funds or programs, except those required by Federal or State Law (unemployment tax, worker's compensation, income taxes, etc.).

Please specify the type of benefits provided:

- 1) Medical or hospital care Blue Cross 4) Disability \_\_\_\_\_  
2) Pension or retirement \_\_\_\_\_ 5) Vacation, holiday \_\_\_\_\_  
3) Life Insurance Utopia 6) Other (please specify) \_\_\_\_\_

**CERTIFIED STATEMENT OF COMPLIANCE**

For the week ending date of 9/26/09,

I, Robert Craft of XYZ Corporation, (hereafter known as  
Employer) in my capacity as Owner (title) do hereby certify and state:

**Section A:**

1. All persons employed on said project have been paid the full weekly wages earned by them during the week in accordance with Connecticut General Statutes, section 31-53, as amended. Further, I hereby certify and state the following:

- a) The records submitted are true and accurate;
- b) The rate of wages paid to each mechanic, laborer or workman and the amount of payment or contributions paid or payable on behalf of each such employee to any employee welfare fund, as defined in Connecticut General Statutes, section 31-53 (h), are not less than the prevailing rate of wages and the amount of payment or contributions paid or payable on behalf of each such employee to any employee welfare fund, as determined by the Labor Commissioner pursuant to subsection Connecticut General Statutes, section 31-53 (d), and said wages and benefits are not less than those which may also be required by contract;
- c) The Employer has complied with all of the provisions in Connecticut General Statutes, section 31-53 (and Section 31-54 if applicable for state highway construction);
- d) Each such employee of the Employer is covered by a worker's compensation insurance policy for the duration of his employment which proof of coverage has been provided to the contracting agency;
- e) The Employer does not receive kickbacks, which means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided directly or indirectly, to any prime contractor, prime contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a prime contractor in connection with a subcontractor relating to a prime contractor; and
- f) The Employer is aware that filing a certified payroll which he knows to be false is a class D felony for which the employer may be fined up to five thousand dollars, imprisoned for up to five years or both.

2. OSHA~The employer shall affix a copy of the construction safety course, program or training completion document to the certified payroll required to be submitted to the contracting agency for this project on which such employee's name first appears.

Robert Craft owner 10/2/09  
(Signature) (Title) Submitted on (Date)

**Section B: Applies to CONNDOT Projects ONLY**

That pursuant to CONNDOT contract requirements for reporting purposes only, all employees listed under Section B who performed work on this project are not covered under the prevailing wage requirements defined in Connecticut General Statutes Section 31-53.

Robert Craft owner 10/2/09  
(Signature) (Title) Submitted on (Date)

Note: CTDOL will assume all hours worked were performed under Section A unless clearly delineated as Section B WWS-CP1 as such. Should an employee perform work under both Section A and Section B, the hours worked and wages paid must be segregated for reporting purposes.

\*\*\*THIS IS A PUBLIC DOCUMENT\*\*\*  
\*\*\*DO NOT INCLUDE SOCIAL SECURITY NUMBERS\*\*\*



## CONNECTICUT DEPARTMENT OF LABOR

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Misclassification (JEC)****Stop Work Orders****Reports of Activities****FAQs****Newsroom****Contact Us****OCCUPATIONAL CLASSIFICATION BULLETIN**

The Connecticut Department of Labor has the responsibility to properly determine "job classification" on prevailing wage projects covered under C.G.S. Section 31-53.

***Note: This information is intended to provide a sample of some occupational classifications for guidance purposes only. It is not an all-inclusive list of each occupation's duties. This list is being provided only to highlight some areas where a contractor may be unclear regarding the proper classification.***

**Below are additional clarifications of specific job duties performed for certain classifications:**

- **ASBESTOS WORKERS**

- Applies all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems.

- **ASBESTOS INSULATOR**

- Handle, install apply, fabricate, distribute, prepare, alter, repair, dismantle, heat and frost insulation, including penetration and fire stopping work on all penetration fire stop systems.

- **BOILERMAKERS**

- Erects hydro plants, incomplete vessels, steel stacks, storage tanks for water, fuel, etc. Builds incomplete boilers, repairs heat exchanges and steam generators.

- **BRICKLAYERS, CEMENT MASONS, CEMENT FINISHERS, MARBLE MASONS, PLASTERERS, STONE MASONS, PLASTERERS. STONE MASONS, TERRAZZO WORKERS, TILE SETTERS**

- Lays building materials such as brick, structural tile and concrete cinder, glass, gypsum, terra cotta block. Cuts, tools and sets marble, sets stone, finishes concrete, applies decorative steel, aluminum and plastic tile, applies cements, sand, pigment and marble chips to floors, stairways, etc.

- **CARPENTERS, MILLWRIGHTS. PILEDRIVERMEN. LATHERS. RESILIENT FLOOR LAYERS, DOCK BUILDERS, DIKERS, DIVER TENDERS**

- Constructs, erects, installs and repairs structures and fixtures of wood, plywood and wallboard. Installs, assembles, dismantles, moves industrial machinery. Drives piling into ground to provide foundations for structures such as buildings and bridges, retaining walls for earth embankments, such as cofferdams. Fastens wooden, metal or rockboard lath to walls, ceilings and partitions of buildings, acoustical tile layer, concrete form builder. Applies firestopping materials on fire resistive joint systems only. Installation of curtain/window walls only where attached to wood or metal studs. Installation of insulated material of all types whether blown, nailed or attached in other ways to walls, ceilings and floors of buildings. Assembly and installation of modular furniture/furniture systems. Free-standing furniture is not covered. This includes free standing: student chairs, study top desks, book box desks, computer furniture, dictionary stand, atlas stand, wood shelving, two-position information access station, file cabinets, storage cabinets, tables, etc.

- **CLEANING LABORER**

- The clean up of any construction debris and the general cleaning, including sweeping, wash down, mopping, wiping of the construction facility, washing, polishing, dusting, etc., prior to the issuance of a certificate of occupancy falls under the *Labor classification*.

- **DELIVERY PERSONNEL**

- If delivery of supplies/building materials is to one common point and stockpiled there, prevailing wages are not required. If the delivery personnel are involved in the distribution of the material to multiple locations within the construction site then they would have to be paid prevailing wages for the type of work performed: laborer, equipment operator,

electrician, ironworker, plumber, etc.

- An example of this would be where delivery of drywall is made to a building and the delivery personnel distribute the drywall from one "stockpile" location to further sub-locations on each floor. Distribution of material around a construction site is the job of a laborer/tradesman and not a delivery personnel.

- **ELECTRICIANS**

- Install, erect, maintenance, alteration or repair of any wire, cable, conduit, etc., which generates, transforms, transmits or uses electrical energy for light, heat, power or other purposes, including the installation or maintenance of telecommunication, LAN wiring or computer equipment, and low voltage wiring. **\*License required per Connecticut General Statutes: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9.**

- **ELEVATOR CONSTRUCTORS**

- Install, erect, maintenance and repair of all types of elevators, escalators, dumb waiters and moving walks. **\*License required by Connecticut General Statutes: R-1,2,5,6.**

- **FORK LIFT OPERATOR**

- Laborers Group 4) Mason Tenders - operates forklift solely to assist a mason to a maximum height of nine (9) feet only.
- Power Equipment Operator Group 9 - operates forklift to assist any trade, and to assist a mason to a height over nine (9) feet.

- **GLAZIERS**

- Glazing wood and metal sash, doors, partitions, and 2 story aluminum storefronts. Installs glass windows, skylights, store fronts and display cases or surfaces such as building fronts, interior walls, ceilings and table tops and metal store fronts. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which requires either a blended rate or equal composite workforce.

- **IRONWORKERS**

- Erection, installation and placement of structural steel, precast concrete, miscellaneous iron, ornamental iron, metal curtain wall, rigging and reinforcing steel. Handling, sorting, and installation of reinforcing steel (rebar). Metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which requires either a blended rate or equal composite workforce. Insulated metal and insulated composite panels are still installed by the Ironworker.

- **INSULATOR**

- Installing fire stopping systems/materials for "Penetration Firestop Systems": transit to cables, electrical conduits, insulated pipes, sprinkler pipe penetrations, ductwork behind radiation, electrical cable trays, fire rated pipe penetrations, natural polypropylene, HVAC ducts, plumbing bare metal, telephone and communication wires, and boiler room ceilings. Past practice using the applicable licensed trades, Plumber, Sheet Metal, Sprinkler Fitter, and Electrician, is not inconsistent with the Insulator classification and would be permitted.

- **LABORERS**

- Acetylene burners, asphalt rakers, chain saw operators, concrete and power buggy operator, concrete saw operator, fence and guard rail erector (except metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation.), hand operated concrete vibrator operator, mason tenders, pipelayers (installation of storm drainage or sewage lines on the street only), pneumatic drill operator, pneumatic gas and electric drill operator, powermen and wagon drill operator, air track operator, block paver, curb setters, blasters, concrete spreaders.

- **PAINTERS**

- Maintenance, preparation, cleaning, blasting (water and sand, etc.), painting or application of any protective coatings of every description on all bridges and appurtenances of highways, roadways, and railroads. Painting, decorating, hardwood finishing, paper hanging, sign writing, scenic art work and drywall hanging+ for any and all types of building and residential work.

- **LEAD PAINT REMOVAL**

- Painter's Rate
  1. Removal of lead paint from bridges.
  2. Removal of lead paint as preparation of any surface to be repainted.
  3. Where removal is on a Demolition project prior to reconstruction.
- Laborer's Rate
  1. Removal of lead paint from any surface NOT to be repainted.
  2. Where removal is on a *TOTAL* Demolition project only.

- **PLUMBERS AND PIPEFITTERS**

- Installation, repair, replacement, alteration or maintenance of all plumbing, heating, cooling and piping. **\*License**

*required per Connecticut General Statutes: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2 S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4.*

- **POWER EQUIPMENT OPERATORS**

- Operates several types of power construction equipment such as compressors, pumps, hoists, derricks, cranes, shovels, tractors, scrapers or motor graders, etc. Repairs and maintains equipment. **\*License required, crane operators only, per Connecticut General Statutes.**

- **ROOFERS**

- Covers roofs with composition shingles or sheets, wood shingles, slate or asphalt and gravel to waterproof roofs, including preparation of surface. (tear-off and/or removal of any type of roofing and/or clean-up of any and all areas where a roof is to be relaid)

- **SHEETMETAL WORKERS**

- Fabricate, assemble, install and repair sheetmetal products and equipment in such areas as ventilation, air-conditioning, warm air heating, restaurant equipment, architectural sheet metal work, sheetmetal roofing, and aluminum gutters. Fabrication, handling, assembling, erecting, altering, repairing, etc. of coated metal material panels and composite metal material panels when used on building exteriors and interiors as soffits, fascia, louvers, partitions, wall panel siding, canopies, cornice, column covers, awnings, beam covers, cladding, sun shades, lighting troughs, spires, ornamental roofing, metal ceilings, mansards, copings, ornamental and ventilation hoods, vertical and horizontal siding panels, trim, etc. The sheet metal classification also applies to the vast variety of coated metal material panels and composite metal material panels that have evolved over the years as an alternative to conventional ferrous and non-ferrous metals like steel, iron, tin, copper, brass, bronze, aluminum, etc. Insulated metal and insulated composite panels are still installed by the Iron Worker. Fabrication, handling, assembling, erecting, altering, repairing, etc. of architectural metal roof, standing seam roof, composite metal roof, metal and composite bathroom/toilet partitions, aluminum gutters, metal and composite lockers and shelving, kitchen equipment, and walk-in coolers.

- **SPRINKLER FITTERS**

- Installation, alteration, maintenance and repair of fire protection sprinkler systems. **\*License required per Connecticut General Statutes: F-1,2,3,4.**

- **TILE MARBLE AND TERRAZZO FINISHERS**

- Assists and tends the tile setter, marble mason and terrazzo worker in the performance of their duties.

- **TRUCK DRIVERS**

- **Definitions:**

- 1) "Site of the work" (29 Code of Federal Regulations (CFR) 5.2(l)(b) is the physical place or places where the building or work called for in the contract will remain and any other site where a significant portion of the building or work is constructed, provided that such site is established specifically for the performance of the contract or project;
  - (a) Except as provided in paragraph (l) (3) of this section, job headquarters, tool yards, batch plants, borrow pits, etc. are part of the "site of the work"; provided they are dedicated exclusively, or nearly so, to the performance of the contract or project, and provided they are adjacent to "the site of work" as defined in paragraph (e)(1) of this section;
  - (b) Not included in the "site of the work" are permanent home offices, branch plant establishments, fabrication plants, tool yards etc. of a contractor or subcontractor whose location and continuance in operation are determined wholly without regard to a particular State or political subdivision contract or uncertain and indefinite periods of time involved of a few seconds or minutes duration and where the failure to count such time is due to consideration justified by industrial realities (29 CFR 785.47)
- 2) "Engaged to wait" is waiting time that belongs to and is controlled by the employer which is an integral part of the job and is therefore compensable as hours worked. (29 CFR 785.15)
- 3) "Waiting to be engaged" is waiting time that an employee can use effectively for their own purpose and is not compensable as hours worked. (29 CFR 785.16)
- 4) "De Minimus" is a rule that recognizes that unsubstantial or insignificant periods of time which cannot as a practical administrative matter be precisely recorded for payroll purposes, may be disregarded. This rule applies only where there are uncertain and indefinite periods of time involved of a short duration and where the failure to count such time is due to consideration justified by worksite realities. For example, with respect to truck drivers on prevailing wage sites, this is typically less than 15 minutes at a time.

- **Coverage of Truck Drivers on State or Political subdivision Prevailing Wage Projects**

- Truck drivers **are covered** for payroll purposes under the following conditions:
  - Truck Drivers for time spent working on the site of the work.
  - Truck Drivers for time spent loading and/or unloading materials and supplies on the site of the work, if such time is not de minimus
  - Truck drivers transporting materials or supplies between a facility that is deemed part of the site of the work

and the actual construction site.

- Truck drivers transporting portions of the building or work between a site established specifically for the performance of the contract or project where a significant portion of such building or work is constructed and the physical places where the building or work outlined in the contract will remain.

*For example: Truck drivers delivering asphalt are covered under prevailing wage while "engaged to wait" on the site and when directly involved in the paving operation, provided the total time is not "de minimus"*

- Truck Drivers **are not** covered in the following instances:
  - Material delivery truck drivers while off "the site of the work"
  - Truck Drivers traveling between a prevailing wage job and a commercial supply facility while they are off the "site of the work"
  - Truck drivers whose time spent on the "site of the work" is de minimus, such as under 15 minutes at a time, merely to drop off materials or supplies, including asphalt.

*These guidelines are similar to U.S. Labor Department policies. The application of these guidelines may be subject to review based on factual considerations on a case by case basis.*

**For example:**

- Material men and deliverymen are not covered under prevailing wage as long as they are not directly involved in the construction process. If, they unload the material, they would then be covered by prevailing wage for the classification they are performing work in: laborer, equipment operator, etc.
- Hauling material off site is not covered provided they are not dumping it at a location outlined above.
- Driving a truck on site and moving equipment or materials on site would be considered covered work, as this is part of the construction process.

*Any questions regarding the proper classification should be directed to:*

*Public Contract Compliance Unit  
Wage and Workplace Standards Division  
Connecticut Department of Labor  
200 Folly Brook Blvd, Wethersfield, CT 06109  
(860) 263-6543*

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**Connecticut Department of Labor  
Wage and Workplace Standards Division  
FOOTNOTES**

- ⇒ Please Note: If the “Benefits” listed on the schedule for the following occupations includes a letter(s) (+ a or + a+b for instance), refer to the information below.

Benefits to be paid at the appropriate prevailing wage rate for the listed occupation.

If the “Benefits” section for the occupation lists only a dollar amount, disregard the information below.

**Bricklayers, Cement Masons, Cement Finishers, Concrete Finishers, Stone Masons**  
(Building Construction) and  
(Residential- Hartford, Middlesex, New Haven, New London and Tolland Counties)

- a. Paid Holiday: Employees shall receive 4 hours for Christmas Eve holiday provided the employee works the regularly scheduled day before and after the holiday. Employers may schedule work on Christmas Eve and employees shall receive pay for actual hours worked in addition to holiday pay.

**Elevator Constructors: Mechanics**

- a. Paid Holidays: New Year’s Day, Memorial Day, Independence Day, Labor Day, Veterans’ Day, Thanksgiving Day, Christmas Day, plus the Friday after Thanksgiving.
- b. Vacation: Employer contributes 8% of basic hourly rate for 5 years or more of service or 6% of basic hourly rate for 6 months to 5 years of service as vacation pay credit.

**Glaziers**

- a. Paid Holidays: Labor Day and Christmas Day.

**Power Equipment Operators**  
(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year’s Day, Good Friday, Memorial day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday. Holidays falling on Saturday may be observed on Saturday, or if the employer so elects, on the preceding Friday.

### **Ironworkers**

- a. Paid Holiday: Labor Day provided employee has been on the payroll for the 5 consecutive work days prior to Labor Day.

### **Laborers (Tunnel Construction)**

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. No employee shall be eligible for holiday pay when he fails, without cause, to work the regular work day preceding the holiday or the regular work day following the holiday.

### **Roofers**

- a. Paid Holidays: July 4<sup>th</sup>, Labor Day, and Christmas Day provided the employee is employed 15 days prior to the holiday.

### **Sprinkler Fitters**

- a. Paid Holidays: Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day, provided the employee has been in the employment of a contractor 20 working days prior to any such paid holiday.

### **Truck Drivers**

(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas day, and Good Friday, provided the employee has at least 31 calendar days of service and works the last scheduled day before and the first scheduled day after the holiday, unless excused.